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POST-MORTEM EXAMINATIONS

A MANUAL OF NECROSCOPY

OR

A GUIDE TO THE PERFORMANCE OF
POST-MORTEM EXAMINATIONS

WITH

*NOTES ON THE MORBID APPEARANCES AND SUGGESTIONS
FOR MEDICO-LEGAL EXAMINATIONS*

FOR THE USE OF PRACTITIONERS AND STUDENTS




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PREFACE.

THIS MANUAL is intended to serve as a reminder to the busy practitioner, and a guide to the student, of what is to be done and observed in making *post-mortem* examinations, and also to assist them in describing and understanding the various lesions which may be met with.

It is far from being complete, and is not intended as a substitute for other pathological works, but as a supplement to them. Disputed points in pathology have been specially avoided, and the lesions are described as simply and concisely as possible.

Very few notes have been made on the microscopical appearances in disease, as they would have increased the size of the work too much, and also have exceeded its purpose.

The Author will be glad to receive corrections and suggestions.

PRINCIPAL WORKS REFERRED TO.

AITKEN	.	.	.	<i>Science of Medicine.</i>
CHURCHILL	.	.	.	<i>Diseases of Women.</i>
"	.	.	.	<i>Mannual of Midwifery.</i>
DELAFIELD.	.	.	.	<i>Post-mortem Examinations.</i>
DRUIT	.	.	.	<i>Surgeon's Vade-mecum.</i>
GOUBERT	.	.	.	<i>Manuel de l'Art des Autopsies.</i>
GRAY	.	.	.	<i>Anatomy.</i>
GREEN	.	.	.	<i>Pathological Anatomy.</i>
GUY AND FERRIER	.	.	.	<i>Forensic Medicine.</i>
HARLEY AND BROWN	{ <i>Demonstrations of Microscopic</i> <i>Anatomy.</i>			
JONES AND SIEVEKING	.	.	.	<i>Pathological Anatomy.</i>
ORTH	.	.	.	<i>Diagnosis in Pathological Anatomy.</i>
VIRCHOW	.	.	.	<i>Post-mortem Examinations.</i>
WILKS AND MOXON	.	.	.	<i>Lectures on Pathological Anatomy.</i>

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A

MANUAL OF NECROSCOPY.



I.

INTRODUCTION.

PATHOLOGY being the basis of medical science, so in proportion to the advance that is made in the study of morbid structure will that science become more exact. The physician who trusts alone to observed symptoms is little better than a mere empiricist. Without pathology nosology is imperfect, diagnosis uncertain, and prognosis unreliable ; and as successful treatment depends on these, not only the credit of the physician but also the well-being of the patient hang on the proper understanding of the morbid alterations which accompany disease. These can only be learnt by constant and repeated post-mortem examinations, and it is most essential that the examinations should be conducted carefully and skilfully, in a systematic manner, and with regard to what has been previously observed.

Post-mortem examinations should be performed as often as possible, for though the observed appear-

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ances can be predicted in certain diseases, an examination will not be without value, for something fresh is almost sure to be noticed ; but if not, the familiarity with these known appearances, and with post-mortem structure generally, is important. If no lesion can be found it does not follow that there is none, for in every case of death there must be one or more : it is there, but it has escaped detection. A more extended acquaintance with diseased structure, and a better method of examination, which only practice can discover, will eventually teach us the pathology of these hitherto lesionless diseases. For, as M. Robin observes, ' we cannot find out where the lesion is because we have not received that experimental education necessary to describe it. The lesion exists in these cases ; perhaps it is general, and consequently more serious ; only it is not yellow, nor red, nor hard, nor soft : it may be beyond what is directly perceptible to the senses. A number of means that we have not yet used have possibly to be discovered in order to reveal it, the use of which, however, will eventually become as familiar as the scalpel.' Apparent failures, then, are no arguments against, but strongly in favour of repeated necroscopic examinations.

Medical men generally too often neglect this study, and hence so frequently make themselves ridiculous by absurd and ignorant blunders in medico-legal and other evidence, not only thus disgracing themselves and the profession they represent, but defeating the ends of justice or doing harm to some innocent person. We should hear more of these blunders if coroners' inquests were conducted as they should be,

with a skilled medical expert either as coroner, or as an adjunct to the court, in order to determine the value of the medical evidence. Take, for instance, the oft-repeated testimony that death has been caused by 'effusion of serum on the brain;' no pathologist now believes in such a possibility as *serous apoplexy*. The serum more likely does not injure, but protects the brain; at any rate it is only an evidence of some other cause.

The necroscopist must be especially careful in interpreting morbid appearances. He has to consider the remote and proximate causes of all he observes; he has to bring his experience, which ought necessarily to be an extended one, to bear on his observations to teach him how far the lesion is due to disease or post-mortem changes. If, for example, a clot is found in the brain, it is not sufficient to say that death was from this clot; that may be the immediate cause, but other effects must have been at work to cause that clot to form, and these have to be diligently sought for.

In all medico-legal enquiries the pathologist must endeavour to render his observations as complete as they possibly can be, noting not only everything that can have even the remotest connection with the cause of death, but also things which may seem to be quite unconnected with it; for it is impossible to tell how far the omission of even a slight detail may vitiate the entire evidence. In October 1872 a case occurred where, though arsenic was found in the stomach in large quantities after death, the medical evidence was ignored because the heart was not examined. He must try to render his evidence.

as independent as possible of collateral or circumstantial testimony. It is needless to say that he should conduct his enquiry perfectly free from bias ; he has simply to interrogate nature, and if he forms an opinion first as to what he ought to find he will be pretty certain to see just what he looks for.

To conduct a necroscopy as it should be performed is certainly to impose a most difficult task on the hard-worked medical man, whose time is not sufficient for the purpose. There is also the objection, which is no small one, that the cadaveric odour persistently clings to the clothing and hands of the necroscopist for some time after, and renders him an unpleasant attendant at the bedside ; and there is the danger of conveying contagion. He himself may feel unwilling to examine one who has been under his care, while the relatives and friends may also dislike him to do so. Now, these objections might be easily met by the appointment of a special necroscopist to certain districts, who should devote his time to pathology. He would become a valuable assistant to medical men, who could appeal to him to help them to decide from pathology doubtful points of diagnosis, and as an independent authority he might afford useful testimony, from the morbid appearances, as to the result of treatment. The coroner might employ him to make enquiries and furnish particulars in doubtful cases of death, and so many unnecessary inquests might be avoided. In fact, in State medicine such an officer would be of great service.

Still if the medical practitioner do not perform the examination himself, he will often have to examine

and appreciate the account of the appearances that have been observed at post-mortem examinations, and the following pages will be a great assistance to him as well as to students in this respect.

‘The science of morbid anatomy is a record of facts.’ In order to refer to this record so as to be enabled to understand its valuable contents, one has to study it systematically, to turn over the pages with care. This small work is intended as an index, to point out what is likely to be found, and to help in arranging the fresh facts which are certain to be observed at every necroscopy.

Before commencing a necroscopy (*νεκρός*, death ; *σκοπεῖν*, to examine) it is necessary to consider well the purpose of this examination. In medico-legal examinations it is of course to assist in detecting crime, and hence to determine whether death was the result of disease or violence; and if the latter, whether the circumstances preclude the possibility of suicide or accident.

In disease where there is no doubt as to the cause of death we have to consider from the lesions not merely the settlement of pathological questions, though these are important, but the determination of how far the disease might have been amenable to treatment. We have to search for the remote cause of the symptoms which had been observed during life. It is not pretended, in our present state of knowledge, that we shall as yet do much in this respect; we have to collect, observe, and collate facts, and then deduce results from them. The necessity,

therefore, of most careful and extended necroscopies is obvious.

Everything should be conducted by method ; all that is likely to be required must be duly considered and prepared beforehand, for the want of one little detail or necessary instrument or appliance may vitiate the entire examination. Notes must be carefully made at the time ; these may be elaborated subsequently, but the original notes are to be preserved. In describing the post-mortem lesions, it is essential to give as much as possible the *actual* appearances ; and it is also necessary to remember that as there are diseases of which the lesions are as yet not found, so there are lesions which do not correspond to any known disease ; and that most of the lesions observed after death are secondary to the disease itself. This is important, as many mistakes have arisen from regarding the lesions as of primary significance.

II.

EXTERNAL EXAMINATION OF THE BODY.

THIS is necessary in every case, but especially in medico-legal enquiries, and must on no account be carelessly passed over; the omission of a slight detail may have very disastrous consequences.

Note the **surroundings**, objects lying near, &c.; **position and state** of the body; contents of the hands, their condition, &c.—horny, delicate, stained, clubbed-fingered, &c. The nails often contain matter suggesting cause of death and place where it occurred, as grass, weeds, dirt, hair (may correspond with that of the murderer), bits of clothing, &c. The limbs may be fractured, dislocated, bruised, &c. The nostrils and mouth may contain foreign bodies and dust, which also may show locality, &c.

Skin.—Look for burns, tattoo marks (identify body), typhus spots, œdema, sordes at orifices of mouth and nose, pale yellow tint of cancerous diathesis, bronzing, ulcers, &c. Where there are purple streaks along the courses of the superficial vessels, the lining of the internal vessels and heart will be deeply stained with blood pigment, as well as the various organs, as liver, spleen, &c. This state must not be mistaken for inflammation; it is a sign of decomposition, and masks other appearances.

Wounds.—Cuts, punctures, scars, &c. Notice the shape of the wound, direction, size (measure carefully, but remember that contraction may have taken place),

appearance, edges everted or not, contain coagula, contiguous effusion. Marks of strangulation, bleeding from eyes, ears, vagina, &c.

Bruises may be produced immediately after death; if caused during life there is always extravasation; in post-mortem discolouration the vessels are simply distended or surrounded by serum stained with blood pigment. Serious injuries, as fractures, may be caused without external signs. An abrasion of the cuticle appears dry and hard, whether produced before or after death. It is often difficult to tell whether wounds are inflicted before or immediately, or even some time, after death. If there are signs of inflammation, cicatrization, or suppuration, it is easy to say. If the wound is everted and coagula are near, then it must have been done shortly before death.

If several are lying dead together, try to find which died first, from circumstances, position, &c., as well as appearance of the bodies. Estimate the **period since death**, but do so guardedly; remember that the condition is affected by the state of the weather. The temperature of the body is not always a safe guide, for it often rises as putrefaction sets in, and varies according to the state before death and the atmospheric temperature.

Notice the appearance of the **Hair**—this may give important evidence—colour, condition, pediculi, long and lanky (in wasting disease), curly and crisp (in health)—pubic hair and whiskers especially; in phthisis much hair often grows on the chest (according to Wilks and Moxon).

Rigor Mortis, if present, is a sign of recent death. The amount of fat on abdomen often shows the kind of life that has been led—sedentary, addicted to beer-drinking, &c.

Examine the **Mammæ** for milk; abdomen, &c., for signs of pregnancy, recent or remote. In suspected rape, look for semen in or near vagina or on the clothes; put some on a slide with warm serum, and examine under the microscope.

Sometimes the external appearance will afford some clue as to the cause of death—thus, wasted in phthisis, and especially in diseases of the abdominal viscera, when there is often what is called the ‘abdominal face.’ In pneumonia there is generally an herpetic eruption on the lips. The abdomen is distended in ascites and peritonitis (but decomposition produces distension). There may be the peculiar mulberry rash of typhus fever (enteric shows none); the skin is yellowish in pyæmia, and the lymphatics are often affected (swollen, &c.) The colour of the skin will also show heart disease; a livid colour denotes pulmonary affection. Anasarca of arms, face, scrotum, &c., shows kidney disease; of abdomen, liver disease; of one or both legs, that there may be a thrombus in the femoral artery. In general anasarca the blood is at fault.

In looking for post-mortem lesions in particular affections it must be remembered that a disease or a poison (as alcohol) takes possession of a person’s weakest organ, and shows its effect mostly there; hence the differences of appearances from the same cause.

SIGNS OF DEATH.

It is very important to attend to these—firstly, because the person may not be actually dead; and secondly, because the question might be put by some sharp counsel to the medical man whether he was sure at the time of making the necroscopy that the person was dead, and might request him to give proof of this.

Vesalius was sadly troubled from having, as he fancied, noticed the heart beating after having opened a body. In the 'Pall Mall Gazette' for June 24, 1874, there is reported the case of a little girl who was pronounced by the medical man as dead, and placed in a mortuary. In the evening, when a necroscopy was about to be made, the heart was found to be beating. 'The post-mortem was wisely postponed until the following day.' Cases of presumed trance, or other uncertainty as to death, may be easily settled by careful attention to the signs of death.

The Eyes.—Dull, flattened, sometimes wrinkled, soft, flabby, and covered with a viscid mucus. After sudden death, as apoplexy, poisoning by carbonic dioxide, hydrocyanic acid, &c., the eyes may remain bright and distended for some time.

Cadaveric Rigidity.—Not always present, or only for a very short time; electric stimulus may cause movements in those recently dead.

Skin.—Peculiar pallor, livid or lead-coloured in parts; mucous membrane exsanguine at natural orifices; palms of hands and soles of feet yellow; green colour in iliac fossæ (this is very characteristic if present); loss of transparency and of the naturally pink colour in thin parts, as web of finger, &c. If dur-

ing life the lobe of the ear or a finger is constricted by a tight ligature, there is a reddening of the constricted part; this becomes darker and darker till it is converted into a bluish red: just round the ligature there is a narrow white ring. After death these changes do not take place, which are of course due to the return of blood from the part being hindered by compression of the veins. This is a certain sign of death, and is suggested by Dr. Magnus in Virchow's 'Archiv' for 1872. Dr. Danis advises cutting down on an artery—the temporal is the best—an empty state would show death.

FÆTUSES AND NEW-BORN CHILDREN.

Notice the covering of the body, and its position. Special marks—vaccination, moles, wounds, &c. Probable age; weight, conformation; length of body, distance from top of head to umbilicus, and from thence to toes.

6 to 7 months: length 11 to 12 inches, weight 2 lbs.

7 „ 8 „ „ 13 „ 14 „ „ 3 to 4 lbs.

8 „ 9 „ „ 15 „ 16 „ „ 4 „ 5 „

9 „ „ „ about 18 „ „ 6 or 7 „

Head—shape, position and size of fontanelles, ossification of bones, length of hair and colour. State of umbilicus and cord—signs of having been properly attended to, &c. Presence or absence of membrana pupillaris; descent or non-descent of testicles.

SYNOPSIS OF THE CHIEF MALFORMATIONS OF FÆTUSES AND NEW-BORN CHILDREN.

Absence of Organs, acephale (absence of head), anencephale (absence of brain and spinal cord), congenital malformation (of idiots, cretins, &c.),

congenital effusion of serum in the cerebral ventricles (with complete or incomplete development of the brain) or on the external surface; aprosopia (absence of face); absence of eyes, eyelids, iris, mouth, lips, tongue, ear, epiglottis, penis, scrotum, testicles, vesiculæ seminales, ovaries, uterus, vagina, certain ribs or vertebræ, a part of a limb, hand, bladder, œsophagus, stomach, liver, heart, lungs, diaphragm, pancreas, spleen, spinal cord (amyelencephale), &c.

Want of Union in Similar Parts.—Fissure in the median line, involving the cranium, the spinal column (*spina bifida*), the lips, the maxillary bones, tongue, roof of the palate, bladder, urethra, vagina, spleen, linea alba (with hernia).

Imperforation of iris, eyelids, mouth, anus, urethra, vagina, uterus, intestines, œsophagus, valves of the heart, &c.

Joining together of Organs.—Eyes (*monopsia*, *cyclopsy*), fusion of the lower limbs (*symelia*) or of the fingers (*syndactyle*).

Atrophy.—Arrest of development in the limbs, feet or hands inserted on the trunk (*phocomelia*), incomplete limbs.

Augmentation of Organs.—Double organs or increase in number (*supernumerary limbs*, &c.), &c.

Heterogenesis.—Extra-uterine foetus; more than three foetuses at a time; foetus with change in the ordinary situations of the organ; hernia of heart (fissure of sternum), of the abdominal viscera into the thorax, &c.

Double Monsters.—By fusion together of some part of the body; developed equally, unequally, &c.; contained in one another (foetal inclusion).

III.

INTERNAL EXAMINATION.

Order.—1, Abdomen ; 2, Thorax and Neck ; 3, Cranium ; 4, Spine ; 5, Limbs.

Special wounds or other injuries, or parts to be examined particularly—as vagina in rape, throat in suffocation or poisoning, &c.—should receive the first attention ; wounds must be carefully probed and cut down upon. In sudden death of children always carefully examine the mouth at an early stage for foreign bodies, or for marks of compression of throat or mouth.

Method of Opening the Body.—There are several ways of opening the body, but the best is by a longitudinal incision from the symphysis pubis to the xyphoid cartilage, passing to the left of the umbilicus, and thence to the sternal notch ; in cases where the throat is to be examined the incision on the chest is carried on to the chin. The incision may be made through the fat and muscles to the bone, and, unless great care is required, right through the abdominal walls ; then the muscles, skin, and fat are to be dissected off the chest, and turned aside.

The position of the diaphragm, and its relation, should now be examined—this may give some idea as to the cause of death, especially in the case of newborn children—and the position, abnormalities, appearance, &c., of the abdominal contents, without disturbing them. Then proceed to open the thorax. Divide the cartilages of the ribs as near the bone as possible ; in cases of ossification use the bone forceps ;

cut from within outwards, so as not to injure the contents of thorax. Disarticulate the sterno-clavicular joint, raise the sternum, dissecting it from its connections, diaphragm, &c., and remove. Fold the skin of the chest over the ends of the ribs, especially if the bone forceps have been used, in order to protect the hands and arms from injury by the ends of the ribs. Examine the pleuræ for hydrothorax, hæmatorax, and pneumothorax (do not mistake post-mortem hæmorrhage from a wounded vein for ante-mortem hæmorrhage) ; also examine the pericardium and the mediastinum. Remove the heart, tying the principal vessels first ; then take out the lungs, either separately or together.

To expose the tongue and back of the fauces, carry the incision to the symphysis of chin and divide the lip, saw through the lower jaw a little on one side, cut through the muscles and the hyoid bone, and turn on one side, when the whole cavity of the mouth will be exposed. Or the incision may be carried to an inch below the chin ; the skin, &c., dissected off ; the soft parts removed as much as possible ; the mylo-hyoid and other muscles divided close to the lower jaw, so as to expose the mouth ; the tongue drawn downwards and forwards through the opening, the pharynx divided as high as possible, which, with the larynx, is also to be drawn down. The attachments are separated, and thus the whole of the pharynx, larynx, and trachea may be removed *en masse*. In some cases three or four of the upper vertebræ may be removed, and the pharynx opened from behind.

The contents of the abdomen should be examined

and removed in the following order:—1, omenta; 2, stomach (tying closely both orifices first; a blunt pin or wire passed through the cut ends prevents the string slipping off); 3, spleen and pancreas; 4, intestines (notice first the ductus choledochus and vermiform appendix; tie up both ends); 5, liver (take care not to injure the connections; it is sometimes well to remove it with the stomach and pancreas); 6, kidneys; 7, uterus and bladder.

Method of Opening the Head.—Notice the state of the scalp; shave if necessary. Then make an incision from ear to ear across the parietal bones, dissect the integuments off the skull, and turn them over the face and occiput.

Examine the skull carefully for fracture; rub ink in if not very distinct; describe accurately the situation of injury, depression of bones, &c.

Cut a line round the head a little above the occipital protuberance and the frontal sinuses with the scalpel, as a guide for the saw. Then saw through the outer table of the skull carefully, testing the depth occasionally with the handle of the scalpel; break the inner table with the chisel and mallet. (If fracture is suspected, it is better to saw completely through.) Raise the skull cap by means of the handle of the mallet, or an iron lever. If there is adhesion of the *dura mater*, cut through it and remove it with the top of the skull.

In infants the scissors may be passed into one of the fontanelles, and the bones cut with them. The fontanelles must first be examined very carefully for punctures, &c.

IV.

SPECIAL EXAMINATION.

SOME recommend removing the whole of the viscera *en masse*, but it will generally be found most convenient and satisfactory to examine the organs *in situ* and remove separately, unless for special reasons.

ORGANS OF CIRCULATION.

PERICARDIUM.

Examine it *in situ*; it may be adherent, perforated (from mediastinal abscess, aneurism, &c.); congenital defects are rare and uncertain; the membrane may be absorbed.

Open the pericardium and remove the heart, first tying the large vessels and dividing them, cutting the aorta as high up as possible.

Lesions of the Pericardium.—*External Surface.*—Thickened, covered with false membranes, cartilaginous patches, ‘milk’ spots (uncertain what these are), ossiform plates, ulcerations (tubercular or cancerous), serous cysts, ecchymoses, &c.

Internal Surface.—Dry, wrinkled, sticky, roughened, granulated, adherent to the cardiac layer; bright rose colour (acute pericarditis), punctated, coalescing into scarlet patches (more advanced pericarditis), ‘exudation.’

Contents.—Serum (most common; there is normally about $\frac{1}{2}$ oz. to 1 oz.); blood—from rupture, inflammation, purpuric state, &c.; pus—generally laud-

able, sometimes greenish; an albumino-fibrinous fluid, of a seropurulent or soupy nature, holding fibrinous flocculi in suspension, or cellules of pavement epithelium, or fatty granules (generally associated with fatty degeneration of the heart), &c. The quantity of serum may vary from half an ounce to two quarts, and the pericardium may then extend up to the second rib. Rokitansky has met with soft, yellow, beanlike bodies in the pericardium, but they are extremely rare.

Pseudo-membranous Deposit.—Thickening of the natural tissue, or the formation of a fibrinous or cartilaginous (sometimes calcareous) deposit; frequently like the stomach of a calf, or a honeycomb (long-continued pericarditis). Estimate the probable age of deposit by the extent of its adhesion, its organisation, &c. When *villous* it is of long standing.

When there is much effusion, notice if the heart is displaced, if it floats, its form, volume, &c. *Hydropericardium*, the result of general dropsy, must not be confounded with effusion of serum from inflammatory action; the serum in dropsy is of a lighter colour.

Pericarditis, Acute.—*1st stage*, injection with arborescent reddening, but this is seldom seen post mortem; in a day or two *2nd stage*, fibrinous effusion forming a layer over the surface of the heart. In inflammation of *longer standing* there is thickening of the fibrinous layer with serous effusion, and the surface gets shaggy. Sometimes the effusion is purulent.

Chronic Inflammation.—The effused lymph organ-

ises, and several layers are formed ; there is often a fatty deposit on the surface of the heart immediately beneath the first layer. Sometimes there are calcareous patches.

Adhesions, when simple, do not seem to interfere with the action of the heart much ; but when the pericardium is attached to the heart by fibrous bands, then the muscular structure is injured.

Cancer and Tubercle may be found, but they are secondary deposits.

HEART.

The normal size and weight vary considerably ; it usually weighs from 9 to 12 oz. in males, and from 8 to 10 oz. in females ; proportion to body weight, as 1 to 169 in males, and 1 to 149 in females. Thickness of right ventricle to left, as 5 to 13. Both cavities are of equal dimensions. In order to distinguish the right side of the heart from the left, it is useful to remember that the tricuspid valve is on the right (dextra), and the mitral valve is on the left side.

I. *External Modifications*.—Changes in the form, situation, direction, relations, weight, thickness of walls, &c.

External Surface.—Change in the colour of the fibres ; they may be violet, red, grey, pale yellow (signs of fatty degeneration), &c.

There may be ecchymosis (from injury, &c. ; post-mortem staining not to be mistaken for this) ; ‘milk’ patches (probably from alcoholism or rheumatism, though Dr. Wilks thinks they are due to attrition,

a kind of wart, as from pressure of a belt on the chest).

Hypertrophy.—General or limited: eccentric, with dilatation of the cavities. Aneurismal pouches.

Normal contraction (*systole*) of the heart must not be confounded with hypertrophy, though it has been described as concentric hypertrophy; in systolic contraction the muscular structure can easily be stretched with the fingers, and the contraction passes off with the *rigor mortis*.

Hypertrophy may be associated with fatty or fibroid degeneration, disease of the valves, aneurisms, disease of the lungs, pericarditis, &c.; any of these may be a cause. In granular kidney the heart is almost constantly found enlarged.

Atrophy.—Simple, with dilatation, sometimes with contraction; in wasting diseases or as a congenital defect.

Dilatation of the Heart, with atrophy, is most frequent on the right side, and chiefly affects the auricles, often a result of endocarditis and disease of the muscular fibres. It is a serious disease.

Dilatation with hypertrophy of the walls is not so serious; it shows a conservative tendency.

The state of diastole may be mistaken for simple dilatation.

Partial dilatation, or aneurism; contents of the pouches vary according to length of the disease; they may be blood, coagula, laminated fibrinous deposit, &c.

The **Coronary Vessels** may be congested or contain clots or purulent deposits; the walls may be atheromatous (cause of angina pectoris), ossified, &c.

Nerves of the Cardiac Plexus ought to be carefully examined.

Open the heart by a **V** incision, with scissors which are inserted near the apex, one cut passing along the anterior groove, the other along the outer border; begin with the right ventricle.

Examine the contents, and test the patency of the valves either with a stream of water or the fingers; aortic and pulmonary valves by a column of water in the vessels. Measurement of the orifices may be taken with a graduated cone or the fingers.

Having examined the contents, state of the valves, &c., pass one blade of a long pair of scissors (enterotome) through the left ventricle up the infundibulum into the aorta, and divide where most convenient; the pulmonary artery may be opened in the same way through the right ventricle.

II. *Internal Examination.* — *Contents.* — *Clots.* — These are either ante- or post-mortem.

Post-mortem are black or dark-coloured, friable and humid, often covered with a fibro-albuminous layer, not adherent to the parietes, with red corpuscles uniformly distributed through the clot. In the right ventricle and auricle the blood is buff anteriorly and red posteriorly; it is more fluid on the left side.

Ante-mortem ('polypi') are discoloured, greyish

or yellowish white, sometimes very white; have a fibrinous texture; are elastic, tenacious, resistant, more or less adherent to the walls, may be grooved by the passage of blood, occasionally organised. Sometimes they are softened internally to a creamy consistence.

The importance of clots in the heart is not very great; ante-mortem generally show lingering death. Asphyxia is incompatible with the formation of ante-mortem clots. In sudden death the blood is generally fluid. In *apnœa* the right side of the heart is gorged, left nearly empty.

Endocardium.—*Colour*, pink (acute endocarditis) must not be confounded with post-mortem staining. Post mortem redness, from deposition of blood pigment, is more diffuse; there will be fluid blood in contact, and the colouring matter may be washed off or removed by maceration.

Endocarditis.—*Inflammatory* redness, seldom seen post mortem, generally in patches, and remains permanent; there are also other pathological effects, as softening of the muscular structure, &c.

Diffuse inflammation causes a silvery opacity from deposition of fibrin. There may also be atheroma, shown by opaque cheesy patches or calcareous plates.

The endocardium in the left auricle is naturally whitish, as it is thicker there.

The results of endocarditis are serious, as embolism, fibroid degeneration, and dilatation; inflammation generally affects the valves.

‘**Milk Patches**’ are signs of localised chronic inflammatory action, most probably of rheumatic origin, or from alcoholism.

Granulations or Vegetations are formed by a tilting up of the superjacent endothelium from deposition of inflammatory products in the connective tissue; they may become calcareous.

Endocardial Ulcer.—Rare, always begins in a valve, may lead to perforation or aneurism, very rarely to gangrene. Met with chiefly in cases of blood-poisoning, but whether secondary or primary is uncertain.

State of the Walls.—Notice their thickness, size of the cavity, &c. *Muscular structure* firm, friable, granular or lardaceous, fatty, &c.

The muscular structure should be macerated in dilute acetic acid or alcohol, in order to examine it under the microscope; fibres teased out by needles and placed in glycerine.

Tumours—as lipoma, fibroma, carcinoma, cystic, tubercular, &c.—are sometimes met with either embedded in the walls or projecting into the cavity or from the surface.

Fibroid Degeneration.—More common on the right side; substance is firm, leathery; cavity retains the form due to distension; most frequently associated with hypertrophy; it is generally a result of inflammation.

Fatty Deposition must not be confounded with *fatty degeneration*. The latter is a serious affection; the former ('obesity of heart') is not so serious, and is consecutive on general obesity; fatty deposition takes place on the surface of the heart and *between* the fasciculi, the muscular structure being histologically unaltered.

Fatty Degeneration is always serious, the fat being deposited *within* the muscular fasciculi—it is, in fact, a retrograde metamorphosis of the normal structure, which is thus more or less destroyed. The patient may be thin, and yet have fatty heart. It is a cause of angina pectoris.

This disease may be—1. *General*; then usually only slight. Muscular fibres paler, more flabby, break up easier, and leave a greasy stain on the knife. 2. *Partial*; the degeneration is more advanced, but in patches, which cause a mottled appearance, the degenerated parts being yellow or buff-coloured, soft, flabby, and rotten. Tendency to rupture or aneurism. Fatty degeneration occurs in alcoholism, some forms of pleurisy and pericarditis, poisoning by phosphorus (in the latter case all form of muscular structure may be lost, and its place taken by fat globules).

Pigmentary Degeneration.—Muscular structure friable, of a brown colour. This is a rare disease.

Myocarditis (*Inflammation of the Muscular Structure*).—Muscular fibres dark, soft, showing under the microscope at first numerous leucocytes within

and around the fasciculi ; in a later stage, pus. Generally as a result of pyæmia and infectious diseases, or from emboli in the coronary arteries.

Chronic Myocarditis.—More common, usually as a result of rheumatism, it is often clearly traceable to syphilis, and leads to fibroid induration. The interior of the ventricle shows patches of a grey or pearly white colour.

In gummaceous myocarditis (tertiary syphilis) the majority of the muscular fibres are replaced by fibrous tissue, with gummaceous tumours disseminated. These tumours are sometimes of a firm, yellow, cheese-like consistence, and may obtain the size of a pigeon's egg.

'Cardiac Apoplexy.'—This term has been given to cases where hæmorrhagic spots and extravasations of various sizes occur in the substance of the muscular tissue.

Rupture of the Heart.—Most frequent on the left side, seldom at the apex : generally the result of fatty or fibroid degeneration ; sometimes caused by severe injury, as a blow on the chest.

Gunshot wounds are not always immediately fatal ; the patient may live for two or three weeks after.

Cancer and other tumours are occasionally met with.

Valves.—**Auriculo-ventricular** may be changed into an inextensible ring, sometimes funnel-shaped, &c., contracted transversely, adherent to the walls, retroverted, &c. Structure may be softer, atrophied,

perforated (from ulceration, then the orifice is surrounded with vegetations); sometimes contains purulent matter or fatty substance; may be calcified, hypertrophied, or granulated (vegetations); aneurism of the valves; hæmatoma, met with in young children as small papillæ containing blood.

Contraction of the valves is generally caused by prolonged inflammation. There is a peculiar tendency for the valves to become calcified, as the result of long-continued disease.

Aortic.—Adherent to the walls or one another, rolled up or thickened; free borders, rugous, cartilaginous, or cretaceous; covered with warty vegetations (fibrinous or other deposits beneath the endothelium); pierced with small openings (fenestrated). Aortic valvular disease is infinitely more dangerous than mitral disease.

Depositions of coagula on the valves may be mistaken for ‘vegetations;’ they may be distinguished from them by being easily removed with care, leaving the valve whole; coagula often form on vegetations.

Average Size of the Orifices. (*Peacock.*)

R.	Auriculo-ventricular (tricuspid)	= $4\frac{5}{6}$ inches,	or 54·4 lines
L.	„ „ (mitral)	= $3\frac{11}{12}$ „	44·3 „
	Pulmonic	= $3\frac{13}{24}$ „	40 „
	Aortic	= $3\frac{1}{6}$ „	35·5 „

These dimensions vary considerably in different individuals.

Shape of the Heart.—*Globular*—the right side larger than the left, met with in pulmonary obstruction, as emphysema or cirrhosis; also in mitral obstruction, but then the left ventricle is hypertrophied as well.

‘*Bovine*’ Heart—left ventricle much enlarged, in aortic obstruction.

General Enlargement does not arise from valvular disease, but from obstruction in some remote vessels, as those of the kidney, &c.

MALFORMATIONS.

Arrest of Development.—In rare cases only two chambers, in other cases three; origin of aorta and pulmonary artery from left ventricle; transposition of vessels; absence of pulmonary artery; obliteration or destruction of aorta and persistence of *ductus arteriosus*; patency of the foramen ovale.

None of these malformations has been proved to be the cause of cyanosis, which is still uncertain, though it may be associated with any of them.

BLOOD-VESSELS.

The vessels should generally be slit up (small ones by means of a fine pair of scissors) and examined internally, aorta sometimes as far as the iliacs. Before opening them, take the diameter either by the finger or a graduated cone.

Arteries.

Lesions.—Hypertrophy, atrophy, dilatation (cylindrical, fusiform, or sacculated) or contraction of the

aorta; arteritis; black or violet stains; atheromatous patches on the internal surface of aorta, or floating white cartilaginous plates in the arch; clots more or less obstructing the tube of any of the vessels; aneurism of the aorta, which may burst into the trachea; sometimes the horizontal and vertical portions of the arch of the aorta are united, &c.

Clots, when organised, should be carefully followed along the course of the vessels; in puerperal fever they often extend some distance.

Narrowing of the Calibre of an artery may be congenital or from arteritis, pressure of a tumour, thickening of the tunics or cartilaginous changes; it leads to gangrene of the part supplied.

Arteritis.—(*Rare*), walls reddened, thickened, or sometimes thinned and friable, structure being pulpy exudation of lymph blocking up the vessel (this may be purulent, albuminous, or fibrinous). Cavity narrowed, full of soft clots, &c. *General* arteritis is unknown.

Chronic Arteritis or Atheroma.—Frequently associated with syphilis and as a result of old age. *1st stage*, deposition of greyish translucent material in the intima; *2nd stage*, fatty or calcareous degeneration. Sometimes fatty degeneration produces what is called an atheromatous abscess or ulcer.

Aneurism.—1. *Dissecting*, from rupture of inner and middle coats, due to atheroma. 2. *Diffuse* or

general dilatation. 3. *Saccular* or true aneurism. Causes : arteritis, pressure, embolism, laceration. 4. *Varicose*, with or without a cyst. The contents of the aneurism should be carefully observed ; they may be soft clots or laminated fibrinous deposits.

Intercranial Aneurisms.—Cause of convulsions, apoplexy, paralysis, insanity, &c.

Veins.

Examined chiefly in cases of phlebitis, spontaneous gangrene, varicose aneurisms ; they should also be examined in subjects affected with varicose veins, œdema, pulmonary embolism, purulent infection, &c. Search for varicosities, and see if they are inflamed or softened ; examine the venous network at the upper part of the thigh ; open the saphena. Notice the uterine sinuses, isolate the utero-ovarian veins with the point of a knife, then open them ; do the same with the vascular plexus of the broad ligaments and the ovarian veins. Soft and discoloured phleboliths are sometimes found in the vessels here, attached to their walls by a thin pellicle ; sometimes there is sup-puration.

In **Phlegmasia Alba Dolens** there are clots or pus in the iliac or hypogastric veins, or in one of the principal trunks of the lower limbs.

Principal Alterations in Phlebitis.—*Coagulation of the Blood.*—This is often a cause, not a sign, of inflammation ; there may be coagulation without inflammation. These *Clots* are various ; wine colour, grey or whitish, fibrinous, adherent to the walls or not ; re-

sistent or breaking down under pressure ; containing pus (second period), grumous (later) ; pierced by a central canal.

Walls reddened at first, afterwards white, swollen ; cavity dilated ; the vessel is sometimes moniliform ; adherent to surrounding cellular tissue, often with phlegmonous induration (the vessel then feels like a cord).

Internal Tunic may be red or white (according to degree of inflammation), rough, opaque, thickened, softened, friable, ulcerated, &c.

Observed in pyæmia, poisoning (by dyes, &c.), injuries, &c.

Thrombi from phlebitis, by forming emboli, are often a cause of 'metastatic' abscess, as in the liver, kidneys, lungs, brain, &c.

Pus in Veins.—*Suppurative Phlebitis*, from an abscess bursting into a vein ; in cases of pyæmia, caries, bubo, &c. Primary suppurative phlebitis is rare.

Adhesive Inflammation.—This may be primary, as in old people, or from the pressure of a tumour, but it is generally due to a thrombus.

Phleboliths are calcareous particles which obstruct the veins ; they are derived from degenerated coagula.

Thrombosis is of importance. A clot formed before death *in situ* is a *thrombus* ; may be distinguished from post-mortem clots by—1, adhesion to the walls, 2, organisation, 3, decolorisation, 4, deposition of leucocytes, 5, stratification. Met with in disease of

the heart, cholera, leukæmia, Bright's disease; from pressure on a vein; varicosity; or entrance of pus from an abscess into a vein (rare), &c. The thrombus becomes lighter in colour, drier, firmer, and more adherent, by age.

Embolism.—Obstruction of a vessel by particles of coagulated matter from a distant part. Originates from thrombi, 'vegetation' from heart, portions of new growth, parasites, pigment granules, &c., escaping into the circulation and being carried to some distant part. Produces either necrosis or engorgement from obstructing the circulation.

Plugging of the basilar or other artery of the brain causes paralysis and red softening of the brain; of the pulmonary, asphyxia; of the coronary, paralysis of the heart. Collateral circulation may be established; if it be not, then there is necrosis. The part which has been cut off is surrounded with a very characteristic zone of intense hyperæmia.

Hæmorrhagic Infarcts may form from impaction of an embolus, escape of blood, and formation of a thrombus; often met with in the lungs, spleen, and kidneys. They are firm, wedge-shaped masses of a dark red colour.

LYMPHATICS.

These are not generally examined so often as they should be, considering their importance.

Inflammation.—Red line and swelling along the course of the vessel. This redness generally subsides after death. Walls thickened, opaque, less resistant;

cavity dilated, may contain clots or even pus; abscesses sometimes form along the course of the vessels. Surrounding cellular tissue infiltrated with a sero-albuminous, half-concrete fluid. It is never primary, but always follows some inflammation of the surrounding connective tissue, as from metritis, abscesses, poisoned wounds, &c.

Chronic affections of the lymphatics are found in cancer, tubercle, scrofula, &c.

Lymphatic Glands.—Morbid changes are nearly always secondary. Hypertrophied in phthisis, secondary and tertiary syphilis, typhoid fever, glanders, &c., mostly in the axillary, cervical, and thoracic regions; sometimes soft, sometimes hard (syphilis). Tumefied, red, soft and friable, or suppurated (*Acute Inflammation*). Swollen, adherent to surrounding tissue, containing a caseous mass like raw potato; this sometimes softens and becomes like pus, or it may calcify (*Tubercular Degeneration*).

Cancer.—Rare as a primary, but common as a secondary, affection.

Syphilis.—Something like tubercular disease, only the glands are not so enlarged.

Other Changes.—Calcification, melanosis, epithelioma, amyloid degeneration, &c.

Lymphadenoma.—Enlargement of the glands from hyperplasia of their elements; they may be soft or hard. When associated with anæmia and affections of the liver, spleen, &c., it constitutes **Hodgkin's Disease**.

The glands often retain pigments and poisons introduced from without.

V.

RESPIRATORY SYSTEM.

BEFORE removing the lungs, notice the form of the pleural cavity; if encroached on by the liver, stomach, &c.; search for fistulous openings, especially in pneumothorax. If this was suspected before death, run a trocar in before opening the thorax, and notice the rush of air; the amount of this can easily be measured by allowing it to escape into an inverted measure glass filled with water and standing in a basin or pail; press up the diaphragm to get as much air out as possible. If there is any fluid in the pleura, state its nature, quantity, and appearance. It may be measured by means of a glass tube with an elastic ball at the end; by compressing this ball, and allowing it to expand, the smallest quantity of fluid may easily be removed, and if the tube is graduated it can be read off at once.

Examine the mediastinum for cancer, hæmorrhagic effusion (from bursting of an aneurism, &c.), acephalocystic tumours, ossific plates, air (as general emphysema of infants), abscess of lung opening into the pericardium, &c.

Feel carefully round the walls of the chest for fracture of the ribs (and compare the seat of these with disease of lung or pleura); look for osteophytes (old-standing pleurisies); abscesses; tumours (as cancer) in the intercostal spaces, &c.

Having examined the chest as much as possible with the lungs *in situ*, remove them thus:—Divide

the trachea and œsophagus as high as possible; separate all adhesions, drawing the lungs downwards and forwards; then sever their connection with the diaphragm. If the lungs are adherent to the walls, they must not be torn away, but the costal pleura is to be carefully detached with them.

Notice the external shape, appearance, extent of hyperæmia (post-mortem hypostasia will give evidence of the position of the body at and after death). Examine the edges, the base, and the apex; press with the fingers, in order to estimate the consistence, induration, elasticity, &c. Attach a blow-pipe to the trachea and inflate; see if the whole lung is permeable to air; then let the air escape: this will give an idea of the elasticity of the tissue. Inflation will also detect fistulous and other openings between the lung and the pleura, &c. When the lung is suspected of being perforated, but no opening can be seen, put the whole lung under water and inflate; bubbles of air will escape from the injured part. Pass the long blade of a pair of scissors into a bronchus and follow the ramifications of the bronchi; this is better than simply incising the lung.

LARYNX, TRACHEA, BRONCHI, &c.

Mucous Membrane.—Red and swollen, with much mucus (*laryngitis*, catarrhal, syphilitic, &c.), greyish, thickened with muco-pus (*chronic laryngitis*); œdematous (*œdema glottidis*, in children especially, also in Bright's disease, &c). Œdema is always less apparent after death than during life, and the only evidence of it may be a wrinkling of the mucous membrane.

Suppuration (often secondary to erysipelas, &c.); plastic exudation in the larynx or trachea (croup, *cynanche trachealis*, diphtheria), in the bronchi (plastic bronchitis; this is a rare disease; the exudation may take a cast of the bifurcations in an arborescent form). Yellowish white, opaque and viscous or purulent mucus (chronic bronchitis); surface velvety or granular, bluish (a sign of suffocation), reddish, violet, slate-coloured (different forms of bronchitis); thickened, thinned, softened, &c.

Various Lesions.—Foreign bodies (with inflammation); *ulcerations*, syphilitic—small, rounded, yellowish nodules with much fibroid formation, chiefly at the edges of the epiglottis; if severe, there may be a shaggy or flocculent appearance; tubercular—in early stage as small corpuscles, then ulcers which from coalescence of small ones become large and deep, chiefly near the glottis; typhoid—rare in this country, situated at the back of the larynx, generally a result of gangrene.

There may be dilatation; this is either general or saccular; thinning; obliteration; perforation; or contraction (from pressure within or without); ossification of the cartilages (senility). Various tumours, as mucoid, fibroid, chondroid, &c.

Bronchial Glands.—Red, black, tumefied, tuberculous, cretaceous, or cancerous.

The Bronchi are opened by means of very fine scissors with unequal blades (*bronchotome*), or by a director introduced into the tubes and a blade of an

ordinary pair of scissors, or scalpel passed along it.

In Dilatation search for the cause; this is generally obstruction from cretaceous or scrofulous matter blocking up a bronchus, or from condensation of lung tissue; it is often met with in asthma.

Parasites are never met with in the air passages of man as a disease; if found, they have been introduced accidentally since death.

Bronchitis.—Redness of mucous membrane, from a bright red to a purple colour; swelling. Secretion of viscid or purulent mucus, this oozes from the tubes on section. In infants death may be from sudden effusion, causing suffocation. Always open the bronchi, and especially examine the smaller tubes, as these may contain purulent matter, &c.

Chronic Bronchitis.—Mucous membrane may be deep red, violet or slate-coloured; sometimes thickened, at other times thinned and reticulated. The bronchi are filled with thick mucus or muco-pus; in long-continued bronchitis this secretion may be offensive and of a dark colour. It is often associated with emphysema and hypertrophy of the right side of the heart.

PLEURA.

Colour.—Red (costal layer in acute pleurisy), citron, opaque (pneumonic layer in acute pleurisy), semi-opaque, yellow (chronic pleurisy), greenish (last stage of phthisis).

Contents.—Clear serum (chronic pleurisy), may cause carnification and atrophy of lung from pressure ; may be ascitic fluid (in general dropsy) : thin layer of lymph, easily peeled off (early stage of pleurisy); thick layers are generally superimposed layers of varying consistence, sometimes it gets like cartilage (old-standing pleurisy) : abscess—pus contained in a sac formed by lymph ; this may burst through the chest or into lung ; adhesions—from organisation of lymph ; ossific deposits as true or false bone ; layer of fat (rare) ; cancer is always secondary, as hard, white, flat, and smooth scattered patches ; blood—from fractured ribs, rupture of aneurism, purpuric state, &c. (see p. 14) ; air—*pneumothorax*, from disease mostly, as bursting of a small abscess in, or injury to the lung, often the cause of sudden death ; contents of stomach from perforating ulcer ; tubercle (rare, always secondary), as miliary granulations, which may become confluent and cheesy by age.

LUNGS.

Hypertrophy ; this state is often uncertain ; when one lung is wasted or destroyed, its fellow may become considerably hypertrophied ; atrophy (from pleurisy, &c.)

Colour.—Normal is grey when the lung is deprived of its blood ; in disease it may be greenish, bluish, livid, rose red (also in infancy), pale yellow ; slate colour, from breathing air loaded with carbon, as coal dust ; claret colour ; brown, from particles of hæmatoidin in passive pulmonary congestion ; &c.

Consistence.—Density and elasticity diminished

or augmented. Condensation (*atalectasis*, a return to the foetal state) is either congenital or arises from pressure, or want of power to expand, distinguished from hepatisation by the surface being depressed and not granular. Splenisation—lung substance softened, reddened, serous; hepatisation—red, solid, like liver, granular on section, sinks in water; grey hepatisation, or carnification, colour paler, more solid. Hyperæmia—lung solid, brown sometimes, in long-continued congestion, moister in more recent; not to be confounded with post-mortem hypostasia, which is darker and forms on dependent parts. Friable, softened, engorged; more crepitant than natural, as in emphysema.

Emphysema—may be either interstitial (surface appears studded with beads) or vesicular (projections from surface that on section are like a sponge, met with in old-standing bronchitis and phthisis); induration or *cirrhosis*, from fibroid changes, is a result of chronic inflammation; fibroid induration, with cavities and ‘tubercles’ (sometimes called ‘chronic pneumonic phthisis,’ but it is properly chronic pneumonia); pigment induration—lung dark, dry, and firm, in some cases of heart disease; gangrene—lung broken up, fetid, fluid of a dirty greenish colour. Adherent to diaphragm, ribs, &c.

Morbid Products.—Miliary granulations; cretaceous tubercles; tubercular or syphilitic cicatrisations (it is difficult to distinguish these from each other); gummata of tertiary syphilis are grey, cheesy, irregularly shaped; ulceration, abscess (pyæmic, phthisic, inflammatory, &c.), perforations (from ulceration, injury, &c.); cavities; œdema—the lung is heavier,

denser, and somewhat translucent, a frothy fluid escapes on section (in dropsy and Bright's disease); pigmentation, spurious melanosis or miner's phthisis—the lung tissue is quite black, either in patches or throughout, from deposit of carbon, probably from smoke or fine dust; the lung may also be infiltrated with powdered glass (in glass workers), with metals (as in knife grinders), with silica, &c.

Cancer, medullary (primary rare), epithelioma (secondary); sarcomata, osteo-sarcomata, enchondromata, lymphomata; hydatids (having escaped from the liver through a perforation).

Apoplexy of the Lung.—*Hæmorrhagic infarction*.—Blood is effused in the pulmonary parenchyma, coagulated, of a dark colour; it sometimes produces inflammation. The part affected is of a globular or wedge shape, with the base towards the surface, varying in size from a pin's head to an orange, and consisting of a cavity bounded by comparatively healthy tissue. Endeavour to trace the burst bronchus; the artery leading to the part will be found plugged by an embolus or a thrombus from an inflamed vein or from '*vegetations*' (clots) detached from the valves of the heart.

Emphysema.—*Interstitial or Interlobular* is rare, most frequently associated with general emphysema; it is also seen in children who have died of some long-standing bronchial affection. The lung surface appears studded with beadlike bullæ. This condition is not apparently of very great importance.

Vesicular is the most common form. It is due to dilatation of the air vesicles. The lung feels somewhat doughy on pressure, does not collapse, and is dry and exsanguine. Bullæ, or apparent projections of lung substance, are seen on the front surface of the lung; on section these parts are like a sponge. It is mostly associated with *chronic bronchitis* and dilatation of the right side of the heart.

Lesions in Phthisis.—(Changes are found most and more advanced in the upper part of the lung).

a. Miliary Granulations.—Isolated or joined together, grey and semi-transparent (1st stage); yellowish white and opaque (2nd stage). ‘*Tubercles*’ (caseous matter), softened (with or without infiltration of the pulmonary parenchyma), suppurated; transformed into cretaceous, puriform, or greenish yellow, souplike matter (gangrene). *Cavities* (vomicae), more or less large, nearly empty, or filled with a white, yellow, grey, green, purulent, sanious, inodorous, or fetid liquid; their walls softened or indurated, regular or broken up, or beset with pseudo-membranous deposits; with consecutive pneumonia around them; fistulæ, &c.

b. Concomitant Alterations.—*Pleura.*—Adhesions to the lungs by cellular, fibrous, or cartilaginous bands; pleuro-pulmonary fistulæ. *Air Passages in general.*—Bronchi dilated either uniformly or limited to small areas. Ulcerated by tubercular granulations; bronchioles are sometimes closed and form hard cords, traversing the vomicae.

Digestive Organs.—Mouth, pharynx, and stomach

inflamed; intestinal mucous membrane thickened, thinned, softened, or injected, covered with granulations (tubercular, semi-cartilaginous). *Biliary Organs*.—Liver fatty, hypertrophied, punctated with red spots; bile pale, fetid. *Bronchial and Mesenteric Glands*, hypertrophied, softened, containing tuberculous granulations. *Nervous Centres*.—Miliary granulations disseminated, or in layers, in the pia mater and encephalon; also surrounding the vessels, and in the choroid plexus.

Lesions in Pneumonia.—**Croupous or Lobar Pneumonia.** *a. First Stage (Engorgement).*—Colour of the surface of the lung is violet, livid, or claret colour. *Particular characters of the Parenchyma.*—Floats on water and is permeable to inflation, but it is more bulky, the density and weight are a little augmented, there is crepitation, but less than natural and the elasticity is diminished, the finger can easily be forced into the parenchyma (this distinguishes it from simple œdema). Its cut surface yields a liquid which may be serous, reddish, muddy, or spumous.

b. Second Stage (Hepatisation).—Colour of the surface of lung is a distinctly pronounced dull red, uniform or marbled (from absorption of blood or colouring matter). *Parenchyma.*—Augmentation of volume, it does not float, cannot be inflated, and there is loss of crepitation, the lung substance is hardened, carnified, of a consistence like the liver, or the spleen (splenisation); it is friable. *Cut Surface.*—Clean, dry, presenting red, hard, rounded, or flattened granulations (these being the plugs in the air vesicles).

Liquid escaping from the Incisions (especially by pressure), small in quantity, red, opaque, thick, and muddy.

c. Third Stage (Grey Hepatisation).—*Colour of the Surface* is grey or pale yellow; darker in old people, in children almost white; this last state is generally congenital, and is almost always due to syphilis. *Parenchyma.*—Sinks in water, impermeable to inflation; volume either augmented or decreased; there is induration with very great friability, but less granular than in the last stage. *Liquids escaping from Incisions.*—Matter resembling pus; phlegmonous, reddish, inodorous, or fetid pus. Sometimes there is slight pleurisy with a layer of lymph.

d. Results.—**Abscess**, with an unbroken cavity, or irregular walls; simple or multiple (pyæmic, phlebitic). **Gangrene**, either diffuse or circumscribed. *Colour* in gangrene, various shades of green, brown, or black; surrounding parenchyma infiltrated with illconditioned pus. *Texture* softer and moister. **Absorption.**—Cells become granular and fatty, then absorbed or expectorated. This gives a purulent appearance to the sputa. The lung substance in this state is often so soft as to be broken up on removal.

e. Concomitant Alterations in Pneumonia.—*Pleuræ* almost always more or less inflamed. *Bronchi* full of mucosities or dilated into pouches containing a purulent liquid. *Bronchial Glands* swollen, red, softened. *Heart* with fibrinous clots in the cavities (sign of slow death). *Gastro-intestinal Mucous Membrane* softened.

There is nearly always some pre-existing

chronic disease of one or more of the other organs in pneumonia. The absence of chlorides in the urine may clear a doubtful case even post mortem.

Catarrhal or Broncho-pneumonia (*form of Inflammation of the Lungs in Children*).—Inflammation is limited to single lobules, or groups of lobules; the lung is solidified only in patches; these have a tendency to become chronic and are then yellowish, dry, and crumbling, so that there is an appearance of spots varying in size from a pin's head to a pea, either yellow or puriform; this is very characteristic. Often met with as a sequel of measles, especially in adults.

There is a peculiar form of pneumonia caused by inhalation of particles of food which decompose and cause inflammation or gangrene. This is chiefly met with in the insane, and especially in those who have been fed artificially.

Interstitial or Chronic Pneumonia (*Cirrhosis*).—There is an acute form of interstitial pneumonia, but it is very rare. Generally unilateral. Lung is smaller, parenchyma dark grey or yellowish, smooth, dense, firm (almost cartilaginous), irregularly mottled with black pigment; bronchi dilated. Generally a sequel of some affection of the bronchi, or pleuritic, phthisic, or syphilitic inflammation of the lung. The normal tissue is replaced by a dense fibrous growth. May lead to ulceration and extensive excavations, or gangrene. This was formerly termed 'chronic pneumonic phthisis.'

Typhoid Pneumonia.—There is hyperæmia, and

a spotted appearance of the lung, both externally and internally; chiefly at the posterior part, where there is also consolidation.

Cheesy Pneumonia.—The lung passes through the three first stages of pneumonia, then the lobules are blocked up by epithelial elements which undergo fatty degeneration or caseation. In an acute form this constitutes the so-called ‘galloping consumption.’

State of the Lungs in New-born Children. *Not Respired.*—Lungs like liver, of a uniform colour; surface marked by slight furrows.

Respired (or inflated).—Air cells are a bright red colour if fresh and filled with blood; if they contain less blood, and are examined some time after death, they are of a lighter colour.

Hydrostatic Test.—Not entirely reliable, but still valuable. An unrespired lung sinks; but if decomposition has set in it may float from the contained gases. On the other hand, a respired lung may sink from disease; though some parts would float. Press the piece of lung firmly in a cloth, so as not to injure it; if it still sinks it has never been respired or inflated. Part of the lung may have respired.

VI.

DIGESTIVE APPARATUS.

MOUTH.

Malformations, corrosions (poisoning by caustics, &c.), injuries, marks, &c. The mucous membrane is a dark purple colour in cases of suffocation, &c. Inflammation (*stomatitis*)—gums swollen in nodules, coated with thick tenacious mucus, papillæ prominent. In chronic inflammation the gums waste and seem hard and polished; ulcerations; diphtheritic and croupous exudations. Aphthous ulceration due to a fungus (*oidium albicans*). Small-pox pustules. Gangrene (*cancrum oris* or *noma*), a foul-smelling black patch, which becomes grey and sloughs.

Examine the roof of the mouth for fissures, ulcerations, tumours, &c., of the soft and hard palate.

Tumours. — Fibromata, sarcomata, osseous, myeloid, angiomata, adenomata, papillomata ('epulis' and 'ranula' are old, worn-out terms), epitheliomata, polypi (local hypertrophy).

TONGUE.

Hypertrophy (*macroglossis*), atrophy. Wounds caused by the teeth in spasms or convulsions may furnish important evidence as to the symptoms preceding death. In inflammation (*glossitis*), it is swollen with prominent papillæ. *Ulceration* is either simple or syphilitic; the latter with condylomata or

as deep superficial ulcers with hard walls. *Cancer*.—Scirrhus is nodulated; epithelial has ragged, everted edges. Hydatids are rare. *Ranula* is a cystic tumour caused by obstruction of Wharton's duct and retention of the secretion of the submaxillary gland.

PHARYNX.

Inflammation (*cynanche tonsillaris*, tonsils swollen); suppuration (*quinsy*). The tonsils become permanently enlarged after repeated attacks of inflammation.

Syphilis.—Callous, well-defined, excavated ulcers with a greyish floor ('secondary'); unsymmetrical, deep, more extended, with gummatous thickening of the neighbouring tissue ('tertiary.')

Croup.—Mucous membrane in the early stage is inflamed, then effusion of liquor sanguinis takes place, and afterwards a deposit of a fibrinous matter, which forms the 'false membrane;' this often extends from the larynx to the bifurcation of the trachea.

Diphtheria is not easily distinguished from croup, except by being more severe, sometimes causing sloughing, and by being deeper seated in the substance of the tissue, so that the false membrane cannot be removed.

ŒSOPHAGUS.

Lesions are not frequent, it may be wounded from without or within. *Dilatation*—either partial and sacciform or general, sometimes like a second stomach. *Contraction* arises from pressure of tumours, cicatriza-

tion of ulcers (syphilitic or others), poisoning by caustics or cancerous deposit in the walls. *Inflammation*—mucous membrane is swollen and granular, with uniform redness (rare as an idiopathic affection). The mucous membrane is normally a pale grey colour. *Ulceration*—generally in the form of clean cut, round ulcers sometimes with jagged edges; simple or syphilitic, (in latter case with gummata). *Perforation*—often connected with aneurism of aorta, which bursts into the œsophagus; sometimes joined to the trachea.

Tumours.—Cancer—sometimes medullary, rarely scirrhus, mostly epithelioma. This last appears as a circumscribed growth on one side, sometimes of a warty nature. Warty growths, cysts, myomata. The œsophagus may contain foreign bodies as a mass of food, bones, false teeth, &c., which may pierce the aorta.

STOMACH.

The size of the stomach varies considerably in health; the following table is the mean of several measurements :—

	Inches.		Inches.
Transverse diameter	9 to 10½	Distended.	7 to 8
Vertical „	4 „ 5		2¾ „ 3¼
Antero-posterior	3 „ 4		½ „ ¾
			Empty.

Before opening place a ligature at each end, preventing it slipping off by passing a pin through the coats; then inflate; notice the state of the walls. Put the contents in a bottle, if for medico-legal examination, and seal up *at once*, or put up the whole stomach

without opening. Open the stomach along the lesser curvature, and spread it on a glass or porcelain plate for examination, then wash with a fine stream of water.

A. Appearance of the Coats.—*a. Colour.*—The mucous membrane at death is pinkish white or ash-coloured; about five hours after death it becomes rose yellow. A hyperæmic state is frequently seen independently of the action of corrosive poisons, especially in heart disease; bluish white, grey, slaty or yellowish, from fatty degeneration of the epithelium (chronic gastritis); reddish brown, puckered (chronic gastritis, pellagra, &c.); rugæ studded with red or brown spots in hæmorrhagic effusion and yellow fever.

Mucous membrane transformed into detritus of a chocolate, black, or yellowish colour (poisoning by arsenic, &c.); mammillated (chronic gastritis, poisoning by ammonia).

b. Thickness and Consistence.—Atrophy—post-mortem thinning must not be confounded with disease. Inflamed—swollen, intensely red (rarely seen post mortem), surface covered with thick mucus. Catarrhal inflammation causes at first a slaty colour, with swelling and softening; afterwards induration and hypertrophy.

c. Morbid Productions.—Fungous vegetations. Mucous polypi (sarcomata); hypertrophy of the villi round the glands, and of the glands themselves with hypertrophy of the muscular tissue; this state is often met with in drunkards. Plates or mammillæ of a reddish brown or slaty grey colour (chronic gastritis or catarrhal inflammation). Pus or blood injecting

the mucous membrane in an arborescent form. Fibrinous exudation (*croupous gastritis*) rare, met with in croup, typhus, pyæmia, &c. Gangrenous patches and infiltration with cancerous or melanotic matter. Tubercle is exceedingly rare.

Cancer.—*Scirrhus* is the most frequent form of cancer, distinguished from simple induration (sarcomata or fibromata)—1, by the nature of the cells and cell loculi; 2, by the submucous cellular tissue being increased in substance; 3, by affection of the lymphatic glands. *Medullary* is occasionally met with in the form of bleeding fungous excrescences; *epithelioma* only as extension from the œsophagus; *colloid* sometimes.

B. Various Alterations.—*Ulcers* and scars, either simple, with perforation, or multiple; with adhesion to neighbouring organs (cancer). *Hæmorrhagic effusion* into the mucous membrane is very common, chiefly on the summit of the rugæ in the form of clots, which are brighter or darker according to age. *Softening* is not so important as was formerly thought, being generally post mortem from the action of the gastric juice; if produced during life it is seen chiefly where food is (cardiac extremity and fundus); when perforated during life, there are signs of inflammation and gradual thinning round the hole (which is as if a piece had been punched out). Death after perforation is either from hæmorrhage or peritonitis. Hæmatemesis may be from an exceedingly small perforating ulcer. Amyloid degeneration is occasionally met with.

There may also be distension by gas; dilatation with or without hypertrophy (chronic or rapid). Atrophy and retraction; bilocular stomach, or partial strangulation; hernia through the umbilicus or diaphragm. Notice the changes in relation to other organs; narrowing of orifices, &c.

C. Abnormal Contents.—*a.* Intoxicating liquids; poisons; leaves of plants (as yew tree, which are needle-shaped). *b.* Pathologic liquids — mucus, thick, viscid, ropy or yellowish, more or less adherent to the mucous membrane; black liquid like soot (blood-clots); mixed with food or not; like coffee (plague); sanious or fetid (cancer, phosphorus); lumbrici; foreign bodies, as sealing-wax, nails, buttons, pipe shanks, &c. *Torula cerevisiæ* (yeast plant); aphthæ; *sarcina ventriculi*, &c.

Corrosive Poisons.—Bichloride of mercury causes a slate colour of the mucous membrane; arsenic, a yellow colour, portions of the poison may remain as a white powder; orpiment and Scheele's green leave a green stain, &c.

Mineral Acids.—Greenish, yellow, brown or black glutinous secretion, ragæ softened; ulceration and perforation frequent. Sulphuric acid often bleaches the mucous membrane, which then appears as if coated with white paint. Nitric acid changes the mucous membrane to yellow or green; perforation is less frequent than with sulphuric acid. *Alkalies* produce inflammation, abrasion, and ulceration; and change the mucous membrane to a dark or tawny pulp; perforation rare. *Oxalic Acid*, mucous

membrane pale, free from rugæ, sometimes inflamed; vessels injected. *Nitrate of Potash*, inflammation and black patches. *Alcohol*, deep crimson or dusky red. *Carbolic Acid* somewhat tans the mucous membrane.

Post-mortem Softening and Perforation.—Thinning, with arborescent black vessels running over the part affected; there is usually a kind of water-mark limiting where the contents have acted on the coats. The opening is generally at the cardiac end; the liquid effused is chymous, and the organs in contact are softened without surrounding inflammation; the edges are thin, ragged, shreddy. Circumstances producing these changes uncertain.

PERITONEUM.

Sometimes it is necessary to inflate the lesser cavity of the peritoneum; this is done by introducing a blow-pipe through the foramen of Winslow thus: raise the liver, carry the finger from right to left to the neck of the gall bladder and follow this up.

Changes in the Peritoneum.—Contents. a. Liquids.—May be transparent or not; limpid; frothy; flocculent; albumino-fibrous (chronic peritonitis); of an oleaginous consistence; yellow-citron colour; greenish, &c.

b. Liquids Mixed with other Matters.—*Alimentary*; fæcal; stercoraceous (peritonitis by perforation or rupture). *Bile*, following wounds and rupture of the gall bladder. *Urine*, from rupture of the bladder. *Pus*, chronic peritonitis, or by bursting of

an abscess of the liver, uterus, spleen, iliac fossæ, bladder, &c. *Blood*, liquid or coagulated, mixed with serous effusion (hæmorrhagic peritonitis, or from rupture of an aneurism, &c.). *Gases*—air more or less rich in oxygen or carbonic dioxide.

Foreign Bodies in the Peritoneum. a. Pathologic.

—Miliary tubercles as semi-transparent grey granulations diffused generally, but more abundant on the surface of the diaphragm and spleen. *Cancerous Tumours*, encephaloid or colloid, may spread over the entire surface. Fibrinous bands, joining various parts into one mass. Encysted abscess; blood cysts. *Superfætation* may take place—1, in the fallopian tubes; 2, in the ovaries; 3, in the walls of the uterus; 4, in the vagina; 5, in the peritoneal cavity. Hydatids may be loose or encysted. Biliary or urinary calculi, or intestinal worms, may escape through the walls of the abdominal organs into the peritoneum. *b. Accidental*—received from without. Projectiles, débris of instruments, &c., needles, &c., swallowed.

Chief Alterations.—Mesentery and Peritoneum.

—Grey, slaty (chronic phlegmasia), red (with injection of mesenteric vessels), brown, blackish, bluish (certain forms of chronic peritonitis), light and whitish; infiltrated with serum, pus, blood, &c.; fatty; thickened, thinned, covered with plastic exudations; disseminated miliary granulations (tuberculosis); charged with black matter (melanosis, but probably pigmentary remains of old inflammation); cancerous patches; ecchymosed spots (poisoning by phosphorus); pus, urine, &c. Hernia; shrivelled; cystic tumours; congenital deformities.

The Omenta.—Adhesions to neighbouring organs, to abdominal walls, &c. ; red, violet, wine colour (peritonitis from hernia, *omentitis*) ; black, tumefied, thickened, infiltrated with plastic matters, blood, pus, &c. Gangrene. Surface villous or granulated (simple acute peritonitis). Herniæ.

Peritonitis.—Special Appearances :—

A. Simple Acute Peritonitis.—*a. Peritoneum.*—Dry, sticky, humid ; injected, of a bright red colour, especially along the intestinal folds ; softening ; plastic exudations causing adhesions, &c.

b. Liquids effused (especially on the posterior walls), white, milky, yellow, green, muddy, flocculent, sero-purulent or purulent, mixed with bile, faecal matters or blood. Try to trace the cause of the inflammation, generally it is from disease of some organ covered by the membrane.

B. Puerperal.—Inflammation chiefly in the lesser pelvic cavity or around the uterus and its annexes. The peritoneal and sub-peritoneal cellular tissue is red and infiltrated with pus. Liquids effused are muddy, flocculent, sanious, and fetid, *nearly always purulent*. The peculiar odour is very distinctive. Search for the cause in the uterus, uterine sinuses, &c. ; may be pieces of decomposing membrane or placenta.

C. Consecutive peritonitis—following injury, &c. —redness less vivid. May be local, as over syphilitic affections of the liver, uterus, &c., or over inflammations of the stomach, herniæ, &c.

D. Chronic—more often idiopathic than the acute. There are formations of false membranes (mostly on

the surface of the liver); the peritoneum is thickened, often matted together, greyish, blackish, soft, friable. Liquids effused are sero-albuminous, white, opaque, semi-purulent.

E. Tubercular.—Not so frequent as was formerly supposed; it is generally secondary, but sometimes primary. In the form of disseminated miliary tubercles which are found mostly under the diaphragm. Three forms—1, with ascites; 2, with semi-organised lymphatic effusion; 3, with considerable adhesions to the intestines, and ulcerations.

INTESTINES.

Notice all abnormal relations and conditions carefully *in situ*. In cases of injury or death from hernia open the abdomen first at these parts. Begin the extraction with the duodenum; sometimes it is advisable to leave the rectum. Tie up each end of the intestines, and let them fall as they are removed into a pail of water. When drawing them out to examine and open them, pass one end under the handle of the pail; this disentangles the intestines and limits the section. Some recommend filling the bowel with water before opening—this is useful where perforation is suspected, as in dysentery, enteric fever, &c.—but it is not always well to do this, as it disarranges the contents, and must certainly not be done in cases of suspected poisoning, nor where there may be entozoons, pus, blood, &c.

The exterior must be first carefully examined, and specially diseased parts removed. In opening use an enterotome, and do not cut along the free edge,

as Peyer's patches are situated there, but cut along the insertion of the mesentery. Take care also not to rub the internal surface of the intestines.

The **normal** colour of the intestinal mucous membrane is deep red in the *jejunum*, pale rose in the *ileum*, and dull white in the *large intestines*.

Examine attentively for all causes of intestinal obstruction, &c. Thus, obstruction may be spasmodic, or from narrowing of the walls, &c. Where there is strangulation it is well sometimes to inject the mesenteric artery, and then notice if the fluid penetrates freely into the branches above and below the strangulated part. It is important to state the cause of the obstruction—1, foreign bodies; 2, alteration of the coats; 3, pressure from without (ovary, uterus, glands, &c.); 4, there may be internal obstruction, or diaphragmatic, mesenteric herniæ, &c.

Principal Alterations in the Intestines.—The intestines are best examined under water.

Mucous Membrane. Appearance.—May be thickened, rugous, mammillated, or puffy, with hypertrophy of the muscular coat (hernia); granular (cholera) thinning, softening; ulceration (in acute tuberculisation, especially the mucous glands); gangrenous (malignant pustule, &c.), destroyed, dried up (peritonitis from hernia), friable, flabby (gangrene from hernia, &c.), roughened, ecchymosed (malignant pustule, yellow fever); punctated, injected with blood, pus, &c. Cicatrices of typhoid fever; beset with small-pox pustules (doubtful). *Colour.*—May be red (various forms of enteritis, cholera, &c.), livid, slate colour

grey, yellow (poisoning by ammonia, &c.), black (melanosis, yellow fever, pellagra), blackish brown (strangulated hernia), dead-leaf colour (gangrene from hernia). Portions like washleather (amyloid degeneration), which turn brown after washing and the application of iodine; they are seen mostly in Peyer's patches.

Changes in the Cavity.—*Follicles or Glands* (duodenal or Brunner's, solitary or closed, agminate or Peyer's).—Swollen (scarlatina, typhoid fever, cholera, erysipelas, poisoning by ammonia, &c.); orifices dilated; ulcerated (typhoid fever, sometimes in cholera); tuberculous; obliterated; seat of a confluent eruption (intractable diarrhœa). *Valvulæ Conniventes*.—Augmented in volume; atrophied; covered with ecchymosed patches. *Foreign Bodies*—1. *Developed in the Canal*.—Hard stercoraceous matter (*enteroliths*); ribbon-like concretions of glairy mucus. 2. *Substances Accidentally Swallowed*.—Various metallic plates, toy balls, marbles, knives, scissors, spoons (especially in jugglers, &c.) 3. *Liquids*.—Bloody, puriform, deep brown (yellow fever, poisoning by phosphorus, &c.), bluish green (altered thickened mucus), yellowish scrosity (strangulated hernia), glairy mucus (dysentery), white creamy matter (cholera), reddish mucus, blood more or less coagulated and mixed with excrementitious matters; meconium. It is important to take note of the appearances of the fæcal matter, and this should be mixed with water in order to examine its composition.

Lesions of the Walls.—Narrowing (circular or moniliform), strictures by syphilitic ulcerations, intestinal

atresia; partial impermeability; intestine terminated in a *cul de sac* or in a cord; dilatation; bends distended with gas or liquids; emphysema; pseudo-membranous pellicles, false membranes; hæmorrhage and infiltrated blood (enterrhagia; in softening and apoplexy of the brain, with embolism of the mesenteric arteries, &c.); ulcerations of various origins; perforations of a simple or multiple character, of a typhoid, dysenteric, tubercular, and cancerous nature, and in gangrene from hernia; opening of the intestine through the abdominal wall; rupture (from accumulation of fæcal matters, &c.) Pustular eruption; polypi and vegetations; lymphomata; scirrhus, colloid and medullary cancer, either affecting the structure or adherent to the external face; fatty tumours; hydated cysts adherent to the intestines; entozoons; diverticula of the intestines; œdema of the intestines.

Invagination is best shown by a perpendicular section. Notice the following in order from the outside to the inside:—1, the serous membrane of invaginating intestine; 2, the two mucous membranes in contact; 3, the two serous surfaces; 4, the mucous membrane of the invaginated intestine. There may be double intussusception by another portion of intestine being forced into the first invagination. There is always peritonitis, arising from congestion; this causes plastic effusion, tumefaction, going on to softening and gangrene.

Volvulus is a twisting of the bowels, most frequent in the sigmoid flexure.

Hernia.—Femoral, inguinal, umbilical, obturator, pudendal, ischiatic (into the notch), ventral, vaginal, rectal, diaphragmatic (rare), retro-perineal; this last is very rare, the intestine is forced down behind the inferior mesenteric artery into the mesocolon.

When a strangulated bowel sloughs, it does so where it is strictured; if injured in taxis, it is at the most prominent part.

Incarceration.—By the vermiform appendix of the cæcum, or by passing through a hole in the omentum, &c.

Enteritis.—General (rare); catarrhal—mucous membrane pink, covered with semi-opaque mucus; in fevers, croup, &c.; chronic catarrhal—surface darkened. Local inflammations—*duodenitis* (after burns), *ileitis*, *colitis*, *typhlitis* (inflammation of cæcum and the appendix), perityphlitis (inflammation of the cellular tissue surrounding the cæcum). These last may arise from foreign bodies in the appendix; but, as Wilks and Moxon observe, hard dark concretions may form in this situation from chronic disease, and resemble date stones, &c. Colitis is often mistaken for dysentery.

Lesions in Typhoid or Enteric Fever.—These are mostly situated at the end of the ileum, near the ileo-cæcal valve, at the free or convex edge.

Glands or Follicles (*Agminated or Peyer's Patches*). *First Form*—*Softened or Reticulated Patches*.—Surface slightly raised; glazed, grained,

mammillated; mucous membrane softened, of a brain-like consistence, rose red with grey points; submucous cellular tissue thickened and depressed. Surrounding mucous membrane exceedingly vascular. *Second Stage—Honeycomb Patches.*—Patches raised more considerably, harder, with elastic resistance; submucous cellular tissue (in the whole extent of the patches) yellowish white, firm, dry, and brittle or friable, glistening. Solitary glands in the neighbourhood of the cæcum are white or red, swollen, thickened (rarely) or ulcerated.

Third Stage—Ulcerations.—Often succeeding, on the ninth or thirteenth day, to the softened patches, and still more often to the honeycomb patches; they are due to necrosis and separation of the diseased tissue. *a. Form.*—Oval, elliptical, or circular (a large patch produces an oval or elliptical, a small gland a round ulcer, and partial destruction of the tissues produces an irregular shape). *b. Size.*—From a hempseed to half-a-crown. *c. Colour.*—Red, brownish, slaty grey, or yellow (this is peculiarly diagnostic). *d. Edges.*—Hard, thick, raised, thin, regular or dentated. Perforations in consequence of the destruction of the mucous membrane and of the cellular and muscular coats sometimes occur.

Mesenteric Ganglions especially in the neighbourhood of the cæcum. *a. Colour.*—Delicate rose, deep red, grey, brownish, or violet. *b. Consistence.*—Soft, friable, infiltrated with blood or pus.

Fourth Stage—Cicatrization.—By the approximation and union of the undermined edges with the floor of the ulcer. The cicatrix is slightly depressed,

and less vascular than the surrounding mucous membrane. There is no puckering or diminution in the calibre of the gut. Sometimes the scar is the seat of secondary ulceration, which often leads to profuse hæmorrhage.

Possible Sequelæ.—Alterations of the blood, peritonitis, mesenteric adenitis, colitis, splenitis, hepatitis, nephritis, laryngeal ulcerations, meningo-cephalitis, anthracoid eruption, internal hæmorrhage, erysipelas of the face, abscess of the iliac fossæ, otitis, &c.

Tubercle.—Generally secondary, seated in the submucous tissue, in the form of grey, transparent granulations changing to cheesy matter. First affects Peyer's patches, then the solitary glands, afterwards becomes more general. The surrounding tissue is hyperæmic, red and swollen. Ulcers form after a time, the floors and edges of which are thickened and hard; then small nodules form on the floors of the ulcers.

Tubercular differ from Typhoid Ulcers in that they extend beyond the confines of the follicles and patches, gradually implicating the whole circumference of the gut; they rarely, if ever, heal. If they are oval the long diameter is generally transverse to the direction of the gut; while typhoid ulcers keep to the shape of Peyer's patches. The wall of the ulcer in *typhoid* is abrupt and overhangs the ulcer, shown by squirting water on it; in *tubercle* it rises gradually, and the floor is thicker than the surrounding tissue. Tubercular cicatrisation leads to contraction of the intestines, typhoid probably never. Surrounding parts are implicated in tubercle.

Dysentery.—Lesions are mostly in the large intestines, and chiefly in the descending colon and rectum. In the *mildest* forms the chief appearances are a greyish white layer of fibrinous matter on the summits of the folds of the mucous membrane, which is also swollen, hyperæmic, and softened. Solitary glands are enlarged, and look like small ulcers. In *severer forms* the appearances are more aggravated; the grey matter extends; submucous tissue becomes infiltrated, producing protuberances (*colitis polyposa*); the solitary glands slough and cause ulcers; the tube is dilated with gas, blood, &c. Ulcers may cause perforation and fatal peritonitis. In a *third degree* the mucous membrane is partly converted into a slough of a dark red or blackish brown or greenish grey colour; the contents of the tube are a dirty brown or reddish, fetid, flocculent, grumous matter. *Fourth Stage.*—Gangrene; a large portion of the mucous membrane is converted into a black, dry, roughened mass. *Cicatrices.*—The ulcer may heal by plastic exudation, which often forms fibrous bands, that encroach on the tube.

Cholera.—Rigor mortis strong; skin livid, face sunken, lungs collapsed and dry though dark. The large veins are gorged, and the blood generally is like tar. The intestines are shrivelled, flabby, and lie in a heap together; they are of a rose pink colour. The internal surface is coated with thick mucus and with a white creamy matter, which diluted causes the rice-water evacuations. The solitary glands are enlarged. Cholera very much resembles poisoning by arsenic in its symptoms and post-mortem appearances.

Cæcum.—It is always important to examine this, as foreign bodies often lodge here, and invagination of the colon sometimes takes place. Inflammation of the cæcum (*typhlitis and perityphlitis*) generally arises from accumulation. Mucous membrane at first congested, then ulcerated; sometimes fistulous openings are produced.

The **Vermiform Appendix** may be inflamed, perforated (frequent cause of peritonitis); may contain foreign matter, tubercular deposit, &c. (see page 57). It is sometimes the seat of catarrhal inflammation and ulceration.

Notice the transformation of the **Sigmoid Flexure** sometimes to the right side in the foetus and newborn; this is of importance, especially in performing colotomy.

Rectum.—If necessary, fix it on a cork plate in order to examine it. *Mucous Membrane* may be thinned, thickened, hypertrophied; congested, anæmic, or mottled (catarrhal inflammation); infiltrated with pus, blood, or cancerous matter; ulcerated; covered with patches of false membrane (croupous inflammation and in dysentery); adenomata, as polypoid tumours, in children chiefly.

Various Lesions.—Hernia, vaginal rectocele; various fistulæ and fissures; prolapse; atrophy of sphincter; chancres and syphilitic ulcerations spreading from the vagina; mucous patches; anal erythema; hæmorrhoids (these are varicose veins surrounded by loose

fibrous connective tissue); condylomata; vegetations; hypertrophy of mucous glands (mucous polypi); elephantiasis; cancer, epithelioma; foreign bodies in the rectum; injuries; dilatation. Congenital defects, as imperforate anus, rectum replaced by a fibrous cord, existence of a caudal appendix, &c. May be obstructed by tumours, &c., pressing on it.

VII.

PORTAL SYSTEM.

LIVER.

External Appearance.—Abnormal adhesions by plastic exudations to stomach, diaphragm, colon, &c. (signs of perihepatitis or of hepatic peritonitis, acute or chronic). Depressed below the limit of the false ribs (in hydrothorax, empyæmia, cirrhosis, &c.), or elevated above them (ascites, ovarian dropsy), with abnormal relations to other organs, &c. Notice the state of the round ligament; it may be pervious and afford communication with the systemic circulation. May be changed in volume, deformed from stays, &c. Congenital malformations are rare, the unusual shapes often seen are generally the result of disease.

Take the dimensions as well as weight of the liver. Average weight 50 to 60 oz.; average measure 10 to 12 inches transversely, 6 to 7 inches antero-posteriorly, and 3 inches at the thickest part. The liver may easily be 'washed out' by injecting a stream of water

through the portal vein (by means of a small pipette and india-rubber tube attached to the water tap); this tests its permeability, and also shows certain lesions better, as hæmorrhage into the parenchyma, which remain unaffected.

In making an internal examination of the liver, notice if the parenchyma is friable or greasy; cut in thin slices and wash, examine the structure afterwards, also the washings; press the substance and notice the fluid that escapes.

Lesions.—Colour.—Uniform dark red or brick red, punctated (asphyxia by coal gas); yellow with white streaks (tertiary syphilis), opaque yellow (fatty infiltration), yellow ochre (advanced jaundice), yellow green or brown (cirrhosis); livid, earthy grey, slaty, bronze; like the flesh of an eel; nutmeggy (congestion, disease of the heart, yellow fever, &c.), coffee colour, mustard colour, orange, olive (these last in yellow fever).

Consistence—Fibrous Structure and Peritoneal Layers.—Softened, adherent to neighbouring parts (perihepatitis), cartilaginous, with protuberances, wrinkled, &c. Sometimes in syphilis (tertiary) the fibrous capsule is roughened with miliary or warty products, which are often very numerous; at other times it is thickened, hard, callous, adherent to the diaphragm by numerous ligamentous cords (perihc-patic form of syphilis of liver). *Special Tissue.*—Homogeneous, rugged, friable, dense, dry, bloodless, indurated, fibrous, œdematous, flabby, softened, like spleen, &c.

Various Lesions.—Congestion (in asphyxia—not to be confused with post-mortem congestion); inflammation; hypertrophy (first stage of cirrhosis, plague, jaundice, &c.; but these are not true hypertrophies); atrophy of one lobe or of entire liver (second stage of cirrhosis, advanced jaundice, &c.) Syphilitic induration (lobular cirrhosis); lardaceous degeneration; granular induration of drunkards (acinose cirrhosis); abscess (pus collected in spots or infiltrated), tubercle; *cancer*—epithelioma (secondary), scirrhus, encephaloid, fungoid. Hæmorrhage (in patches; this is probably due to a purpuric state). Adenomata; syphilitic gummata; erectile tumours; hydatid and other cysts; fluke worms; ulcerations; perforations (communicating with the peritoneum, pleura, &c.); tearing and rupture (spontaneous (?) and traumatic); emphysema; displacement, &c. Small-pox pustules have been said to be met with on the liver.

Congestion.—General or partial, produces *nutmeg* appearances; this is most characteristic in chronic congestion. Long-continued congestion produces structural changes from pressure of distended capillaries; the liver cells may undergo fuscous degeneration. In chronic congestion there is fatty degeneration or infiltration. Moderate congestions during life do not show themselves after death.

Inflammation.—*Acute Hepatitis*—little known in this country—leads to abscess, which is either solitary (tropical) or multiple (pyæmic); also arises from injury. In *Perihepatitis* there is thickening of the

capsule, adhesions to other parts, &c. Suppuration of the portal veins is sometimes met with.

Chronic Inflammation leads to cirrhosis, which is an increase in the connective tissue. In *Cirrhosis* the liver is smaller, paler, puckered, producing the hob-nail condition; the cut surface has a mottled, granular appearance. *Colour*, opaque whitish-yellow, passing to a brown. In the early stage of cirrhosis there may be even enlargement, and the liver may appear normal macroscopically, but somewhat firm and dense; on microscopical section the interlobular tissue is seen to be considerably increased.

The cause of cirrhosis is chiefly spirit-drinking. It is often complicated with other liver diseases. A thick coating of membranous substance on the surface is a strong evidence of spirit-drinking.

Syphilis.—Some say that the liver is the most frequent seat of syphilis, as the lungs are of tubercle.

The *surface* is less glistening, and has the colour of *café au lait*; presents many scarlike depressions or tumours, which are whitish or yellowish and puckered. On section there is generally crepitation, and the cut surface is clean, cheesy, of a yellow tint (fatty degeneration), the parts affected are either surrounded by a fibrous zone, or striated in white, fibrous tracts. Often there are fibrous nodes (gummata), like those in the lungs, of a pinkish, slaty grey, yellowish, or whitish colour. They may increase considerably in size; generally they range from the size of a hemp-seed or a pea to a large plum.

Cicatrices.—These may form with or without gummata, and are very characteristic of syphilis; underneath them may very often be seen small masses of fibrous or cheesy matter; the depressions formed by these cicatrices may be very deep, so as to make the liver appear lobated.

Sometimes fibrous patches are seen on the left lobe, probably from attrition of a constantly distended stomach. In infants minute granulations, something like miliary tubercle, are often seen.

Tubercle of the liver is very rare, met with as collections of small round cells (microscopical).

Yellow Atrophy.—This is rare; the liver is very small, soft, lighter in weight, of a dull yellow or yellow-red colour, like wet rhubarb. Microscopically the cells appear broken up and their place taken by granular débris. Chemically the liver contains excess of *leucin* and *tyrosin*.

Brown Atrophy.—Something like yellow, only the parenchyma is firmer and of a deep brown colour.

Fatty Infiltration.—Very frequent; liver paler, softer generally, and larger. On cutting it the knife is coated with oil, and a greasy stain is given to paper. Hold a piece over a lamp till the water has evaporated; the fat will drop out and burn, or can be collected on paper; by maceration in ether the fat is dissolved, and left on evaporation of the ether. But the best test is microscopic examination; the

cells are seen filled with minute globules, which after a time coalesce. *Cause*, want of exercise, too much fatty food, too little oxygenation of hydrocarbons, as in phthisis, in habitual spirit-drinkers; after long suppuration; in cases of poisoning by phosphorus or ammonia; after yellow fever (but it is doubtful whether this is really fat; probably it is yellow atrophy), &c.

Lardaceous or Waxy Degeneration.—Liver larger, heavier, and paler than normal. Wash the sections and apply solution of iodine (iodine 12 grains, iodide of potassium 24 grains, water 3 oz.); this stains the amyloid parts brown, which changes to black or violet by the cautious addition of sulphuric acid. Microscopically, the middle part of the lobules and the inner coat of the arteries are affected with structureless deposit. Nothing satisfactory is known of this change either chemically or indeed clinically.

Pigmentary Degeneration.—Liver dark, greyish brown, sometimes nearly black, larger in early stage, atrophied later on. Chiefly seen in cases of intermittent fever, rarely in this country. Microscopically there is a deposit of round or angular, blackish granules in the centre of the lobules.

Cancer.—Chiefly encephaloid, of a harder structure than usual, forming round tumours about the size of a nut; the liver is enlarged.

Hydatids.—Cysts of various sizes, from a pin's head to a child's head.

GALL BLADDER.

This may be atrophied, obliterated, or distended by liquids. Ulcerated (typhoid fever, retention of bile, &c.), perforated. May contain cholesterine or other calculi; ascarides, acephalocysts, distoma hepaticum, &c.; walls may be thinned, hypertrophied, or fibro-cartilaginous.

Mucous and Submucous Tissue.—Inflamed (hepatic- or chole-cystitis), swollen, opaque, friable, thinned; ulcerated (with black borders, &c.); gangrenous; infiltrated with altered liquids, pus, &c.

Bile.—Yellow colour, deep green, brown, dirty white, grumous, granular; of a thickened, pitchy consistence, or fluid.

Inflammation, Catarrhal.—Walls injected and swollen, cavity full of viscid mucus or mucus mixed with bile. *Croupy*, same appearances but with solid exudations taking the form of the viscus.

Gall Stones.—Translucent crystalline bodies (cholesterine); compound calculi, consisting of a nucleus surrounded by cholesterine, either in crystals or laminæ, sometimes alternating with layers of a mixture of cholesterine with the colouring matters of the blood and bile. They are generally deeply coloured, and mostly consist of cholesterine in combination with lime or lime salts.

PANCREAS.

This is not examined often, probably because its normal structure and uses are so little understood.

It has been found indurated (tertiary syphilis, disease of the heart, &c.), softened (typhoid fever, &c.), hypertrophied either from increase of cellular tissue or endothelium, atrophied (old age, chronic inflammation, fatty degeneration), inflamed (rare), infiltrated with pus; containing gummata. Traumatic lesions are rare. In certain forms of dyspepsia there is ulceration. Tubercle and cancer sometimes affect it. Calculi of phosphate of lime, phosphate of magnesia, and oxalate of lime are occasionally met with.

SPLEEN.

This ought especially to be examined in fevers, and particularly those of an intermittent type, also in leucocythæmia, &c.

Notice the *position*—it may be transposed, displaced by hydrothorax, ascites, ovarian cysts, diaphragmatic herniæ; may be adherent to the diaphragm, stomach, &c.; surrounded by false membranes, clots, &c. Supplementary spleens are occasionally met with, they are due to division, not multiplication.

The *Capsule* may be thickened, either generally or in patches, sometimes granulated; formation of cartilaginous (fibroid) plates.

Colour.—Instead of the normal dark-bluish red it may be violet, with traces of hæmorrhagic softening

(chronic splenitis), marbled, slaty, black, whitish (amyloid); at other times it may be yellowish, from pus infiltrating its meshes.

Weight may be increased from 7 oz. (normal) to 18, 20, or even 30 lbs. In children and adults its proportional weight to entire body weight is from 1 to 320 to 1 to 340; in old age, 1 to 700. *The size* is increased during and after digestion. Normal size, 5 in. long, 3 or 4 in. broad, and from 1 to 1½ in. thick; in disease it may measure twice to four times this. The size is chiefly increased in intermittent fevers, also in jaundice, enteric (typhoid), and typhus fevers, leucocythæmia, rheumatism, plague, scorbutus, tertiary syphilis, acute glanders, asphyxia, insanity (?), tuberculosis—in fact, in all cases where there are much suppuration and alterations of the blood.

Internal Examination may show hæmorrhagic infarcts, infiltration with pus from inflammation, or metastatic abscess; hydated cysts (rare).

Lardaceous or amyloid disease is generally coincident with the same disease of other organs; this at first affects the Malpighian corpuscles, producing the ‘sago spleen.’

The most important lesions are **Hæmorrhagic Infarctions**, in the form of fibrinous grey nodules. These are often met with in disease of the heart, and are probably caused by embolism; they are also sometimes associated with softening of the brain, both being probably from the same cause, viz. vascular obstruction. **Cysts** are occasionally met with, also

crystals of cholesterine, stearine, &c., from retrograde changes in fatty infiltration.

Leukæmia or Leucocythæmia.—Spleen enlarged, surface often mottled. Blood contains an excess of white corpuscles. This disease has been described as a cancer of the blood.

Melanæmia (*Melanosis*).—Deposition of black or brown pigment in various tissues of the body, as in the mucous and serous membranes, bone, brain, liver, lungs, &c. It is believed to be due to an affection of the spleen.

Hodgkin's Disease (*Lymphadenoma*).—Enlargement of the glands of the body, and especially the spleen, which contains a number of yellowish-white, opaque, firm, irregular-shaped bodies formed of gland structure. The liver, kidneys, lungs, stomach, muscles, bones, and subcutaneous tissue may also become affected by this glandular hyperplasia.

VIII.

URINARY APPARATUS.

LESIONS of the kidneys and other parts of the urinary apparatus are more frequent and of greater importance than is generally considered, and thus they are always to be carefully examined.

Before removing the kidneys notice their relations to other parts, their mobility, displacement, fresh relations, periphrenitic and superficial abscesses, the pus of which often infiltrates the lumbar muscles, &c.

Removal.—It is sometimes useful to remove the entire urinary apparatus *en bloc*; in doing so it is simply necessary to remember that the ureters run obliquely downwards and inwards nearly to the borders of the sacro-iliac symphysis; from thence they pass downwards, forwards, and inwards to the base of the bladder, entering between the muscular and mucous coats for nearly an inch, and finally opening into the two posterior angles of the trigone.

The right kidney is generally lower than the left. They are both covered anteriorly with peritoneum; this has to be cut or torn before they can be removed.

SUPRA-RENAL CAPSULES OR GLANDS.

Situated immediately in front of the upper end of each kidney; the right is the shape of a cocked hat, the left somewhat semilunar; their size varies from $1\frac{1}{4}$ to 2 inches long, rather less in width, and 2 to 3 lines thick; they weigh from one to two drachms.

The *Structure* consists externally of a cortical layer of a deep yellow colour, internally of a medullary substance of a dark brown or black colour; there is frequently a space in the centre from breaking down of the tissue, probably from post-mortem decomposition.

The *Principal Changes* are congestion, inflammation and suppuration, hæmorrhage (apoplexy), fatty

degeneration, adenoma, pigmentation, lardaceous or fibroid degeneration, containing caseous-like matter (often independent of tubercle), cancer, tubercle, serous cysts, hydatids. In syphilitic subjects the gland is often hypertrophied, and sometimes contains purulent or yellow matter, &c.

Death may sometimes arise from pressure of the enlarged supra-renal glands on the solar plexus.

Addison's Disease.—Capsule enlarged, fibrous envelope thickened, adherent to surrounding parts; substance hard, nodulated, with no distinction between the medullary and cortical parts. The new material may be either like cartilage, of a greyish colour, or like 'crude tubercle'—that is, of a white or yellowish opaque appearance—sometimes it is mottled, or the tubercular substance occupies the centre and the pinkish grey matter the cortex.

There is much difference of opinion on this disease. Many authors think that bronzing of the skin is due to some affection of the sympathetic nerve; the solar plexus and the semilunar ganglia should therefore be examined.

KIDNEYS.

The normal *size* of the kidney is about $4 \times 2 \times 1$ inches, the left somewhat the longer and thinner. *Weight* varies from $4\frac{1}{2}$ to 6 oz. in the male and 4 to $5\frac{1}{2}$ in the female; the left is the heavier. Proportional weight to entire body is about 1 to 240. The kidneys are rarely absent; sometimes there is only one by

fusion of the two, forming the 'horse-shoe kidney'; they are occasionally misplaced.

External Examination.—Notice, before removal, the state of the **Peri-renal Cellular Tissue**; this may be thickened and indurated (perinephritis), or even ossiform (chronic nephritis), softened, the seat of abscesses, &c.

Then examine the **Renal Capsule**, and notice its appearance and the facility with which it separates from the kidney. Sometimes there are reticulated markings on the surface, hæmorrhagic effusions (as in poisoning by phosphorus, &c.), fibrinous plates and 'milk' patches (rheumatismal nephritis), purulent pustules, &c. Cysts under the capsule are frequently met with, which may contain serum, or a gelatinous fluid, urine or pus. Disseminated white patches, with hypertrophy of the cortical layer of the kidney (simple chronic nephritis). The structure of the capsule may be changed, and it is frequently adherent to the kidney (chronic Bright's disease).

The **Kidney** may be displaced, malformed; atrophied or hypertrophied. *Surface.*—Rugous, granular, sometimes with cicatrices in chronic interstitial nephritis, and certain syphilitic conditions; in the latter there may also be small disseminated gummata (very rare), and the envelope is in these cases thick, opaque, and difficult to remove.

Internal Examination.—Open the kidney with a long thin knife, by cutting, from the convex border towards the *hilum*; it is sometimes useful to make several incisions in this way.

The cortical substance in the normal state is

generally a little deeper coloured than the medullary, and in disease this distinction may be more or less marked. Sometimes the substance is deep coloured (venous congestion, as in asphyxia, diabetes, &c.), inflamed (nephritis), marked with streaks (amyloid degeneration, rheumatism). There may also be pus, either in the form of an abscess or diffused. It is sometimes dilated with urine, from obstruction of the ureter, and in retention of urine, when there is generally more or less atrophy of the cortical structure. It may also be indurated or softened; the seat of amyloid degeneration (test with iodine), especially in tertiary syphilis and where there has been long-standing suppuration in some other part of the body.

Cancer is generally encephaloid, sometimes hæmatoid. Tubercle affects the kidney either in the form of miliary granulations or as a hollow cavity filled with tubercular matter (*renal phthisis*). Hæmorrhagic infarcts are met with in cases of heart disease in the form of wedge-shaped plugs, as in the spleen. Calculi are sometimes found embedded in the substance, and are readily detected. Deposits of fat may form independently of Bright's disease. Numerous cellules are often met with containing clear or yellow-coloured serous fluid, mucus, pus or débris of false membranes, or urine; these cysts may attain a very large size; sometimes they contain hydatids, cysticerci, *Strongylus gigas* (a large round red worm), *Filaria hominis sanguinis* (when present in the blood).

The cortical substance is often studded with white granulations, surrounded with a brownish red border;

they are about the size of a pin's head ; in *acute simple nephritis* these contain pus ; in *traumatic nephritis* they contain plastic lymph or decolourised fibrin. In some cases pus forms between the pyramids. Disseminated crystals of urate of soda are often met with.

Microscopical examinations of the kidney should always be made, if possible.

Changes in Bright's Disease, or Albuminuria
(according to M. Rayer).

a. First Stage—Hyperæmia or Congestion.—Swelling of the cortical substance, and thus increase in volume and weight ; punctated appearance of cut surface (this will be seen better after soaking in water). This condition, without the punctated appearance, may occur in fevers, as *Febrile Congestion* ; it may cause uræmia, but not dropsy.

b. Second Stage.—Greater increase of volume, but there is a combination of anæmia and hyperæmia ; the aspect is marbled and injected in an arborescent manner ; pale tint, with yellow and red patches. Papillæ separated by discoloured fissures.

c. Third Stage—Yellow Degeneration ; 1st form of Bright ; Anæmia.—The hypertrophy continues. Pale, uniform tint, with injection in some parts ; granulations and irregularities from deposit of plastic lymph.

d. Fourth Stage.—The kidneys, still enlarged, are pale ; their surface studded with milky, granular, star-shaped patches, compared to white, creamy clots, and due to a deposit of a fibro-albuminous matter.

e. Fifth Stage.—Granular aspect more marked ; irregularity of the surface of the kidneys.

f. Sixth Stage (Bright's third form).—The kidneys—sometimes smaller than normal—are hard, cartilaginous, unequal, mammillated with small yellow or purple projections.

English pathologists do not recognise the above stages; they regard Bright's disease as of two distinct forms—1, acute (tubal or desquamative nephritis); 2, chronic (granular degeneration).

Acute Bright's Disease (*Tubal Nephritis*).—The kidney is in the state as described by M. Rayer in the first four stages. The capsule readily separates and the surface of the kidney is smooth. At an early period of the disease the organ is large, dark, and soft (hyperæmia); the blood drips from it on cutting it. Then the cortex gets paler and patchy, from swelling of the tubal epithelium; the paleness increases until the patches get white or yellowish white, from deposition of molecular fat in the epithelium; these fatty elements give a creamy appearance to the surface. The fatty degeneration increases still more until the whole organ is one large white mass of fat, without a particle of proper kidney structure to be seen either macroscopically or microscopically.

Chronic Bright's Disease (*Interstitial Nephritis*).—Characterised by the **Granular Kidney**. In the early stage the kidney is hyperæmic and somewhat larger than normally; then atrophy takes place in an irregular manner, cysts are formed, and the surface becomes granular and adherent to the capsule, which is thickened. The colour is often not much changed, but the structure is altered; the cortex is thinner, paler, and sometimes marbled from fatty deposition

Suppurative Nephritis.—Small abscesses form in the substance of the kidney, which sometimes coalesce. They arise from *Pyelitis* (inflammation of the pelvis of the kidney), spreading from the bladder or from a renal calculus, stricture of the urethra, enlargement of the prostate (retention of urine causes abscesses), or most frequently from pyæmia.

Lardaceous Kidney. — Secondary on amyloid degeneration of other organs. The kidney is paler and larger, cortex smooth; but atrophy often takes place subsequently, and it gets more like the granular state. If iodine be applied it causes the Malpighian bodies to appear as brown specks, and some of the minute arteries as streaks.

The Kidneys should especially be examined under the following circumstances:—

In suspected traumatic lesions (rupture, contusion, wounds), pathologic rupture, retention of urine, anuria and other disturbances, uræmia, stricture of urethra, vesical catarrh, vesical calculi, gravel or gout; diseases of the heart, glycosuria (hypertrophy and congestion of the kidneys), rheumatism (rheumatismal nephritis), scarlatina (scarlatinal nephritis), hypochondria, typhoid fever, putrid infection, alcoholism, syphilitic cachexia, œdema of new-born children, poisoning by phosphorus, sulphuric acid (tubules contain a grey detritus), and lead; in fat people; every affection producing albuminuria (long-continued use of diuretics may produce this, as cantharides, arsenic, alcohol, &c.)

Urinary Passages.—The *Tubuli Uriniferi* terminate in an expanded part of the kidney, called the pelvis; this is a continuation of the ureter. The calyces, pelves, and ureters have three coats—fibrous, muscular, and mucous. The surface internally is of a bluish white colour normally; in inflammation (pyelitis) this is swollen, injected, and villous. The inflammation may cause deposits on it of a ‘putty-like’ material, which fill the calyces, or a renal calculus may form. There may also be pus or muco-purulent matter mixed with urine. The pelves frequently become dilated from various causes, as stricture.

Cancer, tubercle, entozoons (*strongylus gigas* in the ureters, *distoma hæmatobium* in the renal vessels); these may be the cause of hæmaturia and albuminuria.

BLADDER.

Carefully notice its relations, adhesions, external appearance, &c. Inject with water in order to observe rupture or fistulæ, &c.; be careful to do this before removal, as the force required to do so may lacerate it. Extract entire, if necessary; this is not difficult, especially if it is inflated first. The bladder may be dilated in chronic stricture, &c., and also from paralysis, as in fever, injuries to brain and spinal cord; the importance of noticing this dilatation in these cases is evident.

The Vesical Mucous Membrane may be roughened, discoloured (chronic catarrh or chronic cystitis), dark-reddish, bright red, greenish grey, or even

bluish black; speckled with small ecchymoses, marbled like granite (catarrh), slate-coloured; œdematous, tumefied (chronic cystitis), covered with mucus or muco-pus; mammillated; the muscular coat may be atrophied (in long-standing paralysis with frequent micturition), hypertrophied (in chronic cystitis and from stricture and calculus); friable, rugous; indurated; softened (chronic cystitis); gangrenous; ulcerated, or containing abscesses (acute cystitis). There may also be exudation, in round spots or striæ, of a croupy matter; tubercle, this is nearly always secondary to disease of the kidney, and is never met with in the female; cancer is also always secondary, met with as scirrhus (rare), encephaloid, and as nodules, or villous or cauliflower excrescences (most common); hydatids, but they may be from the kidney.

Vesico-vaginal, vesico-rectal and other fistulæ (the second may have been from puncture for retention); communications with the uterus, pelvis, perineum, &c. The bladder may be injured by the catheter opposite to the urethral orifice. Prolapse of the bladder may occur during parturition.

CALCULI.

1. Round or oval, smooth in layers, pink or yellow—*Uric Acid*. 2. Mulberry-shaped, of a dark colour—*Oxalate of Lime*. 3. Smooth, white, round or oval, crumbling easily—*Phosphatic*. 4. (Rare) large round or oval, pale yellow, crystallised, smooth—*Cystine*. 5. *Compound Calculi*, alternate deposition of various salts.

Table of the Principal Tests for the Various Calculi.

Heat a small quantity on a piece of platinum foil.		<div> <div>—It volatilises entirely.</div> <div>Heat with caustic soda in a test tube.</div> </div>	<div> <div>—No ammoniacal odour.</div> <div>—Ammoniacal odour.</div> </div>	<div> <div>Dissolve in nitric acid ; solution evaporated takes a red tint, changing to violet in the presence of ammonia vapour.</div> <div>Calcine. Add nitric acid : a beautiful violet tint is produced.</div> </div>	<div> <div>Uric acid.</div> <div>Urate of ammonia.</div> <div>Cystine.</div> <div>Oxalate of Lime.</div> <div>Silica.</div> <div>Ammoniaco-magnesian phosphate (triple phosphate).</div> <div>Phosphate of lime.</div> </div>
c	—It burns, producing an odour of garlic	<div> <div>—The liquid is not alkaline.</div> <div>The liquid is not alkaline. Add an excess of nitric or hydrochloric acid.</div> </div>	<div> <div>—Insoluble</div> <div>Soluble. Add excess of potash or soda.</div> </div>	<div> <div>—Ammonia disengaged.</div> <div>—It does not disengage ammonia.</div> </div>	

IX.

THE GENERATIVE ORGANS.

MALE.

The Testicle and its Envelopes.—Notice position of the testicle; it may not have descended into the scrotum. Undescended testicles generally contain no spermatozoa (Curling); therefore examine them minutely, as this might have an important medico-legal bearing.

Envelopes.—*Extra-vaginal.*—Wounds and contusions; ecchymoses; extravasation of urine in the scrotum and fold of the groin; phlegmonous inflammation and abscess; erysipelatous inflammation (intertrigo); oedema (hydrocele by infiltration); parietal hæmatocele by infiltration or effusion; gangrene; gummatous tumours of the scrotum and consecutive ulcerations; subcutaneous fibromata, sarcomata; fatty tumours, cystoid tumours containing urine; dermoid cysts; foetal inclusions; elephantiasis; fistulæ and fissures; hypertrophy (without alteration of the subcutaneous tissue); epithelioma; melanotic cancer.

Tunica Vaginalis.—Inflammation (acute and chronic, shown by thickening, injection, effusion, &c.), suppuration; cysts adherent to tunic, hydatid cysts; hæmatocele (traumatic or spontaneous; an encysted hydrocele may be converted into one); hydrocele, congenital (communicating with peritoncum), encysted hydrocele, the fluid is sometimes mixed with semen.

A hydrocele may be found—1, investing the epididymis; 2, between the testicular portion and tunica albuginea; or 3, between the reflected portions; diffuse hydrocele (fluid in that part between the internal abdominal ring and the upper part of the tunica vaginalis). Osteo-cartilaginous tumours; cancer; foreign bodies; gas, &c. The internal surface may be reticulated or vascular (inflammation); infiltrated with pus, blood, or serous fluid. There may also be fibrinous exudations (inflammation), filamentous adhesions producing a partitioning into cells, pseudo-membranous sheaths encysting blood, loose bodies (as in joints), &c.

Testicles.—Malformations, congenital atrophy (often associated with imbecility), one or both absent, there is no record of more than two; misplaced, undescended; pathologic atrophy, hypertrophy.

Lesions.—Wounds and contusions; testicular hæmatocele; hernia testis. Inflammation (*acute or chronic orchitis*)—testis enlarged, indurated, (syphilitic), smooth, general enlargement, (scrofulous), nodular (fungous protrusion), atrophied (old age), hypertrophied; abscess (acute glanders); tubercular affections are mostly in the epididymis which then contains miliary granules. Fibroma (rare), sarcoma, enchondroma; encephaloid cancer (colloid and melanotic, very rare); epithelioma; gummata, like those found in the liver—yellow, fleshy, and surrounded by a fibrous zone; cystic sarcoma; hydatids; entozoa; fatty infiltrations (galactoceles); spermatocele; dermoid cysts containing hair, teeth, fat, &c.

Spermatic Cord.—Wounds, contusions; funicular hæmatocele (infiltration or effusion of fluid around the cord, encysted or not); abscess and inflammation of the cellular tissue surrounding the cord (funicular orchitis, acute or chronic funiculitis); hydrocele, diffuse (œdema of cord), communicating with the peritoneum, or with the tunica vaginalis (hydrocele of sac), encysted, &c.; varicocele; hydatid cysts; adipose or gummatous (syphilitic) tumours; tubercular or cancerous degeneration; old hernial sacs forming a tumour on the cord; hydrocele of the funicular hernial sac; hernia of the omentum, of the intestine, &c.

Vesiculæ Seminales and Ejaculatory Ducts.—Ought to be examined in all cases of impotence. In order to expose them saw through the pubes; the tubes should be opened, and some of the fluid contents (mixed or not with a little serum or glycerine) placed on a glass slide and examined under the microscope. They may contain calculi, may be atrophied, tubercular, inflamed, &c.

Prostate Gland.—Can be reached by cutting down on a sound previously passed into the bladder. It may be atrophied; undeveloped; hypertrophied (in advanced life); inflamed (acute and chronic), suppurated, ulcerated; contain tubercle, cancer or cysts (all these last three are very rare); concretions (very frequent); fibroid degeneration.

Penis.—May be imperfectly developed, as in cretins, &c.; rudimentary penis; phymosis, paraphi-

mosis; elongation of prepuce in those who have suffered from calculi; fissured¹ (when very small there is pseudo-hermaphroditism; then look for testicle). Wounds and contusions; strangulated by a ring or wire. Inflammation gives rise to *chordee* from effusion into and thickening of the corpora cavernosa or spongiosa; serous infiltration; abscess and urinary fistulæ; peri-urethral abscesses; excoriations; erysipelas; cancer, chiefly epithelioma; elephantiasis; scabs or exanthematous eruptions amongst those who work in chromates.

Syphilitic Chancres.—Hard or soft; the peculiar characters seen during life are absent after death, and only hardness remains; phagedænic (in weak states), with or without buboes. *Balanitis* (inflammation of the mucous membrane of the glans); *Posthitis* (inflammation of the inner surface of the prepuce); acne, aphthæ and herpes of the prepuce; tearing of prepuce; calculi of prepuce (vary in size from a pin's head to a nut); warty vegetations (epithelioma) on the inside of the prepuce.

Elephantiasis Scroti.—A simple hypertrophy of the cellular tissue of a chronic nature.

Urethra.—In some cases it is necessary to examine this throughout; this may be done by sawing through the pubic symphysis, or by cutting somewhat as for median lithotomy. It may be slit up by scissors (bronchotome) or by a knife on a director, along the

¹ Fissure on the upper surface is called *epispadias*; on the lower, *hypospadias*.

superior wall, and the sides pinned down on a board. Notice the liquid contents, as blood, muco-pus (urethritis), altered spermatic discharge (spermatorrhœa), &c.

The urethra may open into the perineum, scrotum, or elsewhere; if it is completely closed it is called *atresia urethræ*; there may be congenital stricture.

Lesions.—*Dilatation* is most frequent in the membranous part, from obstruction or calculus. *Laceration*, from mechanical injury or calculi. *Inflammation* (urethritis), sometimes catarrhal, but generally gonorrhœal, acute or chronic; mucous membrane swollen, injected and covered with a muco-pus; sometimes there is a plastic exudation, croupous or fibrinous inflammation, the tube is then blocked up by casts (rare). *Stricture* is often the result of inflammation, either long-continued granular or acute urethritis, generally situated about from 4 to $6\frac{1}{2}$ inches from the meatus; may be caused by thickening of the walls or from a fold of membrane, or by cicatrices from ulcers, &c., also from fungous excrescences. Tubercle rare; cancer is secondary to growths near.

FEMALE GENERATIVE ORGANS.

1, Ovaries; 2, Fallopian tubes; 3, uterus; 4, vagina; 5, vulvæ; 6, mammæ. In important necroscopies the whole of the female genital organs should be removed entire; this is not difficult. It is needless to say that the organs should first be examined *in situ*.

Removal.—Raise the uterus; detach the ligaments

carefully, preserving the Fallopian tubes, and the broad ligament as far as the ovaries; separate adhesions and divide the vagina just below the neck of the uterus. In cases where it is advisable to expose the whole of the vagina as well, saw through the pubes on both sides close to the obturator foramina, and remove the symphysis pubis; in this way the whole of the contents of the pelvis will be exposed.

Pelvis.—Notice irregularities and deformities—equable enlargement of the cavity (*pelvis æquabiliter justo major*), equable diminution (*p. æq. j. minor*) rare; various distortions. The normal dimensions are—

Antero-posterior (sacro-pubic), diameter	4	inches.
Transverse (bi-iliac) „	5 to $5\frac{1}{2}$ „
Oblique „	$4\frac{1}{2}$ to 5	„

The bones or ligaments may be softened or eroded; these parts may be injured during labour. Exostoses, either rachitic, scrofulous, or syphilitic; false or cartilaginous exostoses; osteosarcomata may sometimes be met with. Luxations of the hip joint occasionally encroach on the cavity.

Ligaments.—Round.—Lesions are: hypertrophy and lengthening; shortening and adhesion (cause of version and flexion).

Broad.—May be altered in direction and connection. This is sometimes the seat of *peri-uterine hæmatocele*, which is generally consequent on ovarian hæmorrhage or apoplexy, hæmorrhage of the Fallopian tubes, or of the vessels of the broad

ligament, rupture of an extra-uterine pregnancy, or retrograde migration or reflux of menstrual blood, &c. Inflammation and suppuration may attack it. Cystic tumours of the broad ligament may be mistaken for ovarian cysts ; these are frequently due to enlargement of the 'organ of Rosenmüller' (*parovarium*), the remains of the Wolffian bodies, situated between the Fallopian tube and the ovary in the folds of the broad ligament.

Fibrous, encephaloid, tubercular, and other tumours of the broad ligament, are sometimes met with, also cholesteatoma, small cystic tumours containing scales of cholesterine, epithelium, &c. The veins are occasionally varicose or inflamed, as in purulent infection.

Ovaries.

In medico-legal investigations the proper understanding of the normal and morbid appearances of these organs may be of immense importance, and therefore they should be carefully examined in every necroscopy.

Notice first of all their situations and relations to the surrounding parts (they may descend into the groin or labia). They are seldom wanting, though occasionally rudimentary ; there are never more than two.

The normal average size of each ovary is about $1\frac{1}{2}$ inch in length, $\frac{3}{4}$ in width, and $\frac{1}{3}$ thick ; average weight from 60 to 120 grains. They are covered in front by the broad ligaments, and are connected to the uterus by special ligaments. They are of a whitish colour, and the surface is either smooth or uneven.

External Appearance.—They may be flattened, shrivelled, globular, covered with filiform cellular excrescences (*villous cancer*), pseudo-membranous flakes, or star-shaped excrescences, &c.

A smooth ovary is evidence of menstruation not having commenced. At the catamenial period there is rupture of a Graafian vesicle; the opening cicatrizes in about eight or ten days.

They may be friable, softened, red, and congested (ovaritis), slaty or black, œdematous, covered with gangrenous patches (septicæmia), crepitant, &c.

Internal Appearance.—The chief points to notice are the state of the Graafian follicles and the number of the corpora lutea, as these show the frequency of menstruation and impregnation. At the menstrual period the ovary is very hyperæmic, and also during pregnancy. *False Corpora Lutea* (after menstruation only) are small and angular, seldom present a cicatrix, have no cavity, are usually soft, and with only a thin layer of yellow matter or none at all.

True Corpora Lutea are large (often the size of a marble or mulberry), round, project from the surface of the ovary, have a triangular depression or cicatrix at their summit, and contain a small cavity, which becomes stellate towards the end of pregnancy; they are vascular, lobulated or puckered, firm and yellow. Two corpora lutea are formed when there have been twins.

The stroma of the ovary may hypertrophy, atrophy, indurate, or soften,

Ovarian Cysts are the most frequent affections;

these may be either—1, *simple or unilocular*; 2, *tubo-ovarian*; 3, *compound or multilocular*; or 4, *dermoid*.

Notice the adhesions and relations of the cysts, state of the Fallopian tubes (permeable or not), length of pedicle, &c. They may burst into the peritoneum.

Contents of the Cysts.—Clear hyaline fluid, like water; citron or amber colour (recent), milky (from fat globules); thick, mucilaginous, gelatiniform, flocculent, brownish, chocolate colour (from blood or decomposition).

The Dermoid or Piliiferous Cysts contain skin, fatty tissue, hairs, glands, teeth, or bone (regular or irregular).

In **Acute Ovaritis**, which is almost always puerperal, the organ is swollen, vascular, and red or wine-coloured; sometimes it is softened, infiltrated with sanguinolent fluid or even pus, or converted into a grey and sanious pulpy matter. It may burst and produce fatal peritonitis.

Chronic Ovaritis is much more frequent, and is characterised by a fibroid degeneration and thickening of the capsule or of the whole organ.

Cancer of the ovary, either primary or secondary, is generally intermediate between scirrhus and medullary; a peculiar form called *villous* cancer is occasionally seen.

Sarcomata, fibromata, angiomatica, cartilaginous, bony, and other kinds of tumours are sometimes met with.

Fallopian Tubes.

Disease of these is more frequent than is generally thought. They may be adherent to the uterus or ovary (from chronic inflammation or old peritonitis); sometimes they are flexed, or they may be distended (by foetus, blood, &c.) Pass a fine wire through the tubes to see if they are permeable, or inflate them from the uterine extremity. Open them by passing a fine scissors (bronchotome) along them from the fimbriiform end. The mucous membrane may be red or swollen (inflammation—in pelvic cellulitis), or grey and discoloured. Contents may be thick, wine-like, purulent, or whitish, or mixed with tuberculous or cancerous matters (cylindrical cellulules).

Obliteration may be a cause of sterility. *Fibrinous tumours* are occasionally met with in the tubes. *Rupture* sometimes occurs from over-distension by the catamenia, by serum, or by pus; it may also be from tubal foetation, and then takes place about the third or fourth month of pregnancy. *Acute inflammation* is characterised by a swollen, reddened, and vascular state of the lining membrane, which is also infiltrated with serum, lymph, or pus. *Chronic inflammation* may lead to fibroid thickening or to a large accumulation of pus. After impregnation it may be possible to find spermatozoa in the tubes.

UTERUS.

Notice its relations to the surrounding parts before removing it; cancerous and other adhesions; versions and flexions; loss of substance; swelling of the

various glands; compression of the sacral plexus, sciatic nerve, iliac vein, &c. Examine also the state of the neighbouring organs, as the rectum, bladder, &c., also the condition and contents of Douglas's pouch.

Absence of the uterus is very rare. If thought to be absent, search carefully for it or its remains in the recto-vesical pouch, amongst the muscles of the perineum, &c.; rudimentary bodies may be found. The uterus may be bilocular and horned, or unicorn.

Size.—This varies considerably even in health; sometimes the uterus continues undeveloped even in adult life, this arrest of development must be carefully distinguished from premature atrophy.

At puberty it is pear-shaped, weighs 8 to 10 drachms; subsequently it is larger, more vascular, of softer and darker substance: during pregnancy it enlarges immensely. After delivery it returns to nearly its normal size, and then weighs about two ounces; the edges of the labia are fissured, its cavity is larger, and its muscular structure is more apparent than in the virgin state. In old age it atrophies, becomes denser in texture, and the orifices are frequently closed.

The uterus is opened either by cutting it through from one side to the other, or by a T incision, the long arm of which opens the anterior wall half-way up, and the two shorter extend from the two Fallopian tubes to the first.

Lesions of the Uterus:—*a. Walls of the Uterus*.—Pale, red, hypertrophied or turgescient (inflammation), black, shrivelled, friable, indurated, cartilaginous (chronic inflammation), ossiform (rare), flabby

and spongy, softened, partially destroyed (inflammation), ulcerated, infiltrated with pus, fetid-sanious fluid (cancer), false membranes, fungous and polypous growths, gangrenous patches.

b. Veins and Sinuses.—Gaping, gorged with blood, containing clots, in those who have died at the puerperal period; filled with a puriform liquid (puerperal fever?), gas (doubtful if ante or post mortem).

c. Uterus in general.—*Malformation.*—Rudimentary, double, heart-shaped, bicornous, bifid, divided into partitions, unicornous, with occlusion of the orifices.

Versions—ante, retro, latero. *Flexions*—ante, retro, latero. Falling down and prolapse into the vagina or vulva, with or without lengthening, with or without hypertrophy of the neck; prolapse may be due either to laxity of the ligaments or to some change in the vagina. Inversion may have occurred during labour or shortly after, either spontaneously or from too strong a traction on the cord, or from the presence of tumours. *Herniæ* of the uterus.

Wounds.—Traumatic or surgical (Cæsarian section); pathologic rupture, perforation; it may also be injured by attempts to procure abortion.

Various Lesions.—Inflammation (*metritis*), acute is shown by a swollen, softened, and reddened state; puerperal; chronic has two stages—1, infiltrated, hyperæmic; 2, indurated, anæmic; in *endo-metritis* or uterine catarrh the organ is congested and softened, and the mucous membrane red, or purple, or whitish; *chronic endo-metritis* (leucorrhœa); *parametritis* or inflammation of the subperitoneal connective tissue;

false membranes in the cavity from croupous inflammation ; bag-like cysts (*dysmenorrhœa membranacea*) ; softening. Accumulation of fluid (hydrometra), of blood (hæmatometra), of pus (pyrometra), of air (physometra) ; the obstruction in these cases may be either a tumour, cicatrix of the neck, or a swelling from chronic metritis. Cancer and canceroid (these begin to form at the cervix—scirrhus, epithelioma, sarcoma) ; ulcers (phagedænic) ; moles, either fleshy, foetal, or hydatiform. Hydatids and other foreign bodies. *Tumours*.—Cystic, fibrocystic (myoma), fleshy (sarcoma) ; mucous polypi (myxoma) ; glandular or follicular. The so-called fibroid tumours (myomata) are very common, and often take the form of polypi. Gangrene. Retention of the placenta.

Metritis.—The most common form is *endometritis* or inflammation of the lining membrane or uterine catarrh, and is shown by the swollen, injected, and velvety appearance of the mucous membrane, which is sometimes detached ; the surface is coated with a viscid, straw-coloured or purulent discharge, which may be mixed with blood.

Metritis, or inflammation of the substance proper, is nearly always a result of pregnancy or its effects ; the walls are reddened, softened, swollen, and contain much lymph. Sometimes suppuration takes place, and the matter may burst either into the cavity, or into the bladder, rectum, or abdominal cavity ; it may become absorbed. The inflammation may, though rarely, terminate in gangrene. *Chronic metritis* leads either to softening or induration.

Cancer.—This is in the form of scirrhus chiefly, and is characterised by two stages. 1. *Hardening*; the surface of the uterus is uneven, indented but smooth; when cut into, the walls are of a whitish or greyish substance, of a fibroid structure, the meshes containing cancerous juice; thin slices are semi-transparent. 2. *Softening*; this takes place sooner or later, commencing at the cervix, and irregular ulcerations form, which may gradually eat away most of the uterus and vagina, sometimes perforating the bladder or the peritoneum, or the whole of the neighbouring organs and structures may be destroyed. Sometimes large masses of gristly substance, of a papillary nature, form in the ulcers, resembling a ‘cauliflower excrescence.’

Lesions of the Os Uteri.—The normal appearance of the os varies, it is generally a smooth oval slit, but it may sometimes be circular or triangular, like a leech-bite. In disease it may be redder than normal (inflammation), granulated (granular inflammation), unequal and indented, friable, indurated (sequel of inflammation); prominent and hypertrophied, atrophied, narrowed; softened and fungous; ulcerated (tubercular, or syphilitic, or simple); cancerous (encephaloid, scirrhus, hæmatoid, alveolar, or colloid cancer); epithelioma; covered with fleshy protuberances (papilloma or *cauliflower excrescence*—this is not cancer).

Adherent to anterior or posterior walls of vagina; lengthening of the os, sometimes so much as to reach as far as the labia, &c. Showing products of

pregnancy, as adhesion of placenta, &c.; varicose veins, false membranes. Syphilitic ulcerations (chancre is rare), gummatous tumours. Narrowing of the internal orifice; occlusion of the os by a pediculated or sessile fibrous body, by a plastic plug organised during gestation. Rupture of the os is either spontaneous or traumatic from injury by instruments during accouchement, &c.

Malformations.—Double, bifid, or multiple os; congenital obliteration of orifice; absence of os; conical os (may prevent conception).

*The Uterus and its appendices should be especially examined in the following cases:—*Phlegmasia alba dolens; abortion; extra-uterine pregnancy; purulent infection (pyæmia after labour, &c.); affections of the uterine annexes, as inflammation of the ovaries, broad ligament, &c.; sterility; menstrual irregularities; obstinate constipation; uncontrollable vomitings of pregnancy, and other obscure symptoms after confinement.

During Menstruation the uterus is congested, enlarged, and softened; the mucous membrane is swollen, reddened, punctuated with bloody spots, and covered with menstrual fluid, which may be more or less watery. This state must not be mistaken for inflammation.

Appearance of the Uterus after Parturition.—The organ is flaccid, softer than usual, nine to twelve inches long; cavity may contain much clotted

blood, pieces of placenta, decidua, &c.; generally there is a greenish-red fluid covering the internal surface, and a soft, pulpy, raw spot where the placenta was attached, with semilunar openings on its surface. The mucous membrane of the *os* is generally of an orange colour after a recent delivery; this is a very characteristic appearance if present.

The Signs of the uterus having been pregnant are:—the organ is larger and the walls are thickened, the fundus is longer than the cervix; in the virgin womb these are about equal, while in children the neck is the longer; the sinuses and vessels are enlarged, and the *os* is marked irregularly by cicatrices.

Puerperal Fever.—There is inflammation and extreme softness of the uterine walls, which may contain pus either in their substance or the cavity. The adjacent peritoneum is inflamed, and there is pelvic cellulitis. The uterine sinuses are often seen gaping, or blocked up with puriform matter or thrombi; there is secondary affection of the lymphatics, and also of the liver, spleen, kidneys, &c., but, unlike general pyæmia, the lungs mostly escape infection.

Vagina.

Mucous Membrane. — Bright red (vaginitis), brownish, swollen, œdematous (effects of inflammation); covered with granulations due to follicular or papillary hypertrophy; eroded superficially (effects of vaginitis), ulcerated, gangrenous, &c. Vaginitis is usually gonorrhœal. The liquid covering the mucous membrane may be greenish yellow (vagi-

nitis), sanious, diphtheritic, fetid, purulent, sanguinolent, or mixed with clots.

Various Lesions.—Vesical, urethral, or rectal fistulæ; stricture following inflammation, &c.; presence of foreign bodies; superficial or deep follicular cysts; polypi, as fibrous, sarcomatous, or myomatous excrescences, pediculated or not; cancer, encephaloid or canceroid. Syphilitic ulcerations: inversion of the vagina, in falling down of the uterus, and prolapse of the vulva; effusion of blood under the walls (vaginal hæmatocele). Projection into the vagina of various internal tumours, as vaginal herniæ, vaginal cystocele (bladder prolapsing with vagina), rectocele (rectum prolapsing with vagina); abscess in the walls or the peri-vaginal tissues. Fibrous hypertrophy, vegetations. Various kinds of injury may be met with, as from forceps in delivery or instruments used to procure abortion. Poisons, as mercury or arsenic, may be feloniously or accidentally introduced per vaginam.

Malformations—Abnormal opening; congenital stricture; complete absence; obliteration and imperforation (*atresia*), impermeability, divided by a more or less complete partition, bifidity (with or without double uterus).

Vulva, Perineum, &c.

Vulva.—May be wounded; rupture of fourchette; tearing of the hymen, of the meatus (these injuries may arise either during labour from careless use of forceps and other instruments, or from attempted rape). Swelling from effusion of blood (thrombus) or *hæmatoma vulvæ* and œdema of vulva. Eczema,

herpes, erythema, erysipelas, &c. Gangrenous inflammation (*noma* of infants) this must not be mistaken for venereal disease; it is of a deep, dusky red colour, and the ulcers are greyish with a most fetid discharge; it generally arises from a constantly dirty state of the parts. Abscess and vulvitis of little girls (simple, ulcerated, diphtheritic, or gangrenous) are often met with.

In examining for suspected rape on a child, it must be remembered that diseases are frequently seen in children which may be easily mistaken for gonorrhœa. Rape on young children, which may be without penetration, is generally followed by inflammation; then an abundant secretion takes place, at first of a sanious mucus, then of muco-pus of a yellowish-green colour and glutinous consistence.

Lesions.—Non-syphilitic ulcerations; follicular cysts (from obstruction of the sebaceous ducts), met with especially in the neighbourhood of the urethra; vulvular folliculitis (inflammation of the mucous follicles). Warts (*condylomata*), sometimes forming by aggregation cauliflower excrescences; ‘mucous patches,’ these are something of the nature of a wart, and are characteristic of syphilis, they appear as rose- or purple-coloured, circular or oval elevations, flat and covered with a very offensive ichorous secretion; they may coalesce and form larger patches. Cancer, chiefly epithelioma. Fibrous and encysted tumours; hypertrophied lichen (mycosis). Oxyurides may escape from the rectum. Elephantiasis is an hypertrophy of the skin, and must not be mistaken for enlargement from deposition of fat. Obliteration of

the posterior commissure and separation of the labia majores by vaginal or uterine tumours. Vesicolabial herniæ.

Clitoris.—May be confounded with the labia, split into two, absent, or developed in an extraordinary manner. Hypertrophy has no connection with excessive sexual indulgence. The meatus urinarius may be situated on the summit of an hypertrophied clitoris which might be easily mistaken for a penis. There is the case of a woman who was thought to be a man, and married as such; her real sex was only discovered after death by the presence of a uterus.

Perineum.—May be thinned and narrowed from disease; enlarged; absent (either from rupture or as a congenital defect); contused, wounded (rupture and tearing) from labour, attempted rape, &c. Fistulæ, excoriations, intertrigo, eczema, urinary tubercles; perineal hernia and protrusion of the perineum by various internal tumours, as hæmatocele, cystocele, &c.

MAMMÆ.

Before proceeding to open these, it is always well to make a careful physical examination first, in order to estimate their hardness, softness, mobility, &c.; by pressure milk or pus may escape. In order to open them, divide the skin by three or four lines radiating from the nipple to the circumference, and reflect the triangular pieces of skin; or remove the breast entirely by one or two semi-elliptical incisions. Having exposed the organ, notice the state of the lacteal tubes, adhesions to neighbouring parts, &c.

Lesions.—Eczema, syphilitic induration and gumata; *abscesses*, these are termed *extra-mammary* or superficial when situated between the skin and the breast, *post* or sub-mammary when behind the gland, *true* or intra-mammary when the glandular structure itself is affected. *Fistulæ*; partial or general hypertrophy (the breasts generally enlarge at the menstrual period). *Tumours*—adenoma or formed of gland structure; nodulated, elastic or hard (cystic sarcoma), these may be mistaken for cancer; cartilaginous (enchondroma), rare; fibroma (fibrous tumour); fatty (lipoma); mucous (myxoma), rare; spindle-celled sarcoma (this was formerly mistaken for cancer, with which, in fact, it may be associated); milk tumours or obstruction of the ducts with natural secretion (galactoceles); cystic tumours (echinococcus, hydatid, &c.); tubercle, rare; calcareous deposits, probably from retention of milk. *Atrophy*, in old age and wasting diseases.

Cancer.—Most common form is *scirrhus*, which is a hard lobulated tumour at first, with affection of the neighbouring parts and glands. It afterwards ulcerates, and the sore has everted, raised, and puckered edges, with fetid secretion. *Medullary cancer*—brainlike in appearance—is met with in early life. *Colloid* has been very rarely seen.

Adenoma of the breast (simple glandular tumour) is very often with great difficulty distinguished from true cancer, especially in the early stage of the disease.

In **Man** diseases of the breast may occasionally be met with, such as cancer and fibromata. In dropsical or fat men the breasts are often very large, but they have no gland structure. Cases are reported of men having true *mammæ* which secreted milk, but they are doubtful.

X.

THE NERVOUS SYSTEM.

HEAD.

For the method of opening the head see p. 15. Before doing so the **Scalp** must be carefully examined. Notice the colour and state of the hair. Look for fresh wounds and cicatrices, as cuts, bruises, abrasions; ecchymoses with subcutaneous effusion or sanguineous swellings; punctures through the fontanelles or temporal bones (these may be very minute). Varicose aneurisms, œdema, pneumatocele (from communication with the frontal sinuses or mastoid cells), diffuse inflammation of the cellular tissue; erysipelas (see if there is a wound as well, and look for evidences of a debauch); protrusion of the brain through an opening in the skull, from a trephine wound or separation of the sutures (encephalocoele). The head of a new-born child may be injured during labour by instruments or pressure, &c., or by a fall, as on to the ground accidentally. Sanguineous tumours on the heads of new-born children (cephalhæmatoma) arise from pressure during labour.

Skull Cap.

Fractures.—These must be carefully examined, in order to judge the direction, extent, nature of the cause, &c.; where they are indistinct or doubtful it is well to rub some ink in. The bone may be depressed or protruded, or radiated from the point of contact, &c. Always try to determine from the appearance if the injury is from a blow or a fall; take some of the part injured and examine it carefully—microscopically, if necessary—it may retain some particles, as dirt, pieces of wood, metal, &c., which may afford important evidence. Perforations, as in infanticide, may be very small. Exostoses, osteophytes, and periostoses; these may serve to explain some cases of paralysis; notice carefully their exact situation. Premature closure of the fontanelles may be a cause of epilepsy, cretinism, &c.; they may remain open longer than natural, as in hydrocephalus. Irregular development of the skull; not proportionate to the stature. Malformation, as flattening (not traumatic); increase in the basal circumference, rotundity of the cranium (sometimes peculiar to idiotism or epilepsy), general volume increased or decreased externally; take the measure by means of a pair of calipers.

Remove the skull cap as directed at p. 15; if there is fracture the greatest care must be taken in sawing through the bones, and it is well, if possible, to first remove the fractured part entire. Now examine the interior, and see if the abnormalities on the outer have any corresponding state on the inner sur-

face, and also if the lesions affect the dura mater as well. In suspected blows examine the side opposite to the presumed injury for fracture by *contre-coup*, as at the base of the skull. The inner table of the skull may be extensively fractured without any signs of much external injury. If the blow has been from a light weapon sharply applied, the fracture is confined to the seat of the injury; if from a large body moving slowly, the injury is diffused.

Dura Mater.

Carefully examine the external surface as far as it is exposed; notice the adhesions, transparency or opacity, redness, effusion of blood; then judge whether it was produced before or after death, and look for corresponding injury to the bones and scalp either near the seat of effusion or at some distant part. The effused blood may be more or less absorbed sometimes only a thin layer of decolorised fibrin remaining.

The colour of the dura mater is often of a more or less deep yellow, as in jaundice or yellow fever and poisoning by crude carbolic acid. In syphilis there is frequently a peculiar yellowish grumous deposit either in the form of granulations or as a pseudo-membrane. In deaths from prussic acid, or cyanide of potassium, or acute alcoholism, the odour of cyanogen or spirit is distinctly perceptible. The Pacchionian bodies may be enlarged, frequently forcing their way through the pia mater; the nature of this enlargement is uncertain; or they may be disseminated and must not be mistaken for tubercles.

Divide the dura mater either along the edges of the sawn bones or across the vertex, or by a longitudinal incision a little to one side of the longitudinal sinus; then divide the falx cerebri as near the *crista galli* as possible, and turn the membrane aside or back, or remove entirely.

Lesions of the Dura Mater.—Distended with serum (hydrocephalus), with blood, from rupture of a vessel, but see if this is ante or post mortem. Depressed, with wasting of the brain beneath; adherent to the skull, as in inflammation from injury or meningitis; inflamed, nearly always from injury; vessels turgid, showing the mode of death, as poisoning by narcotics, apoplexy, &c.; tubercular and syphilitic granulations, the former as miliary bodies, chiefly at the base, the latter as round, flattened, hard masses; fungoid growths; epithelial and fibrous tumours (notice the exact seat of these); dermoid cysts, containing hair, fat, &c. Patches of purulent matter, effusion of blood between its layers or true bony deposits; cancerous tumours; hydatids. Defects are rare.

Inflammation of the Dura Mater.—*Acute.*—In the early stage it is pinky and softer than normal; then there is infiltration and suppuration or effusion of lymph, giving rise to adhesions and new formations. *Chronic.*—Characterised by the formation of a false membrane on the arachnoid surface, which becomes vascularised, and attached more or less in patches to the brain substance. Many of these false membranes are, no doubt, old blood effusions which have become organised.

Syphilitic Inflammation is shown by a pink or red sarcomatous swelling, generally adherent to the brain, from one-third to half an inch thick and of a roundish, flattened form.

Arachnoid and Pia Mater.

It is generally well to describe these two together, especially as modern physiologists regard the 'outer layer' of the arachnoid as the endothelium of the dura mater, and the 'visceral layer' as belonging to the pia mater; the pia is also the more important, as it is the vascular membrane of the brain.

Lesions.—The membranes may be dry (from undue pressure of the brain), injected (acute inflammation), milky (chronic inflammation); distended with serum (inflammation), blood (if coagulated it is a sign of ante-mortem hæmorrhage; if fluid it *may* have been effused post mortem) or pus (from injury, seldom or never from disease). In idiopathic inflammation of the arachnoid the effusion has been described as being between it and the pia mater; in traumatic inflammation it is between the arachnoid and the dura mater. The pia may be adherent to the dura mater or the brain, either generally or in large or small patches from inflammation, this is often seen in general paralysis and other affections of the insane, &c. Thickened, softened, infiltrated with pus (chiefly along the course of the vessels), or covered with miliary granulations; these latter are nearly always confined to the base and the fissures; if they are seen on the vertex, they have

spread upwards from the base. Tumours of various kinds may be met with, as angioma, sarcoma, fibroma, papilloma, small epithelial growths, steatoma, hydatid cysts, pigmentary deposits, &c.

Meningitis.—*Simple.*—The first stage of active hyperæmia is seldom seen; there is then greatly increased vascularity, more or less diffuse. Afterwards effusion takes place; this may be of various kinds, from a greenish watery fluid to an opaque milky deposit; in rare cases pus has been found.

Tubercular Meningitis.—This is characterised by the deposit of grey, miliary granulations about the size of millet seeds, chiefly in the membranes at the base of the brain. They are met with most abundantly in the fissure of Sylvius, and are generally situated in the peri-vascular spaces; they are always associated with inflammation, and nearly always with general tuberculosis.

The disease is well shown by putting the membrane in a glass vessel of water over a dark surface, when the tubercles appear as white dots.

Tubercular differs from simple meningitis not only by the presence of the tubercles, but also by the effusion being chiefly at the base, rarely or never at the vertex. The hemispheres of the brain are generally flattened from pressure; the ventricles are distended with serum, and their walls are softened.

Vessels of the Brain,

Sinus of the Dura Mater.—May be inflamed;

obstructed by clots, especially at the 'Torcular Herophili;' in cases of poisoning, suffocation, &c., these clots are black and soft; in apoplexy, typhus, certain forms of insanity, &c., they are fibrinous, adherent, and of a yellow or brown colour. In some cases of brain-softening, meningitis, otitis, &c., a thrombus may be found in the sinus. In death after erysipelas, pyæmia, &c., these vessels are sometimes affected with purulent deposits.

Arteries.—May be dilated (aneurisms), impermeable from atheroma or other changes, or obstructed by clots; they may be rigid, tortuous, sometimes calcareous. Affections of these arteries are met with mostly in old people, drunkards, rheumatic subjects, &c., and are frequently a cause of brain-softening or of apoplexy.

Air in the Vessels.—This is generally a consequence of the manner in which the head has been opened, and then of course has no pathological significance; it may sometimes be due to post-mortem decomposition of the blood. Its presence, however, should be stated, and the cause for it determined if possible.

Congestion of the Vessels is mostly a sign of the *mode* of death, and ought not to be considered as a *cause*; it is also often due to the position of the body at and after death. Absence of congestion of the vessels of the brain would suggest the probability that death was *not* from asphyxia.

Serous Apoplexy.—Sudden effusion of serum has

never been known to take place, and hence there is no such thing as serous apoplexy. Serous effusion is generally an accompaniment of brain-wasting, and is not always an inflammatory product.

Uræmia

In cases of sudden death with symptoms of brain disease there may be no apparent lesion, death being due to uræmic poisoning; then look for disease of the kidneys, and test for urea in the blood and brain; it is also important to do this in cases of suspected poisoning.

Test for Urea.—1. *In the Blood or Serum.*—Acidulate with acetic acid; evaporate to dryness over a water bath (small evaporating dish or watch glass in a large beaker of boiling water, with a piece of paper or wood so placed as to let the steam escape); dissolve the urea in boiling alcohol. Then evaporate again to dryness, add a little water, put it in a freezing mixture (or place on a piece of lint saturated in ether), add a few drops of nitric acid. If there is urea the nitrate will form, and can be distinguished by its peculiar form of crystals.

2. *In the Brain.*—A good-sized piece of brain substance is to be cut up into small pieces, and placed in a convenient vessel. Ten ounces of boiling distilled water are poured on them and allowed to stand for six or eight hours, the brain being frequently broken up with a glass rod during this time. The water is then carefully poured off into a clean vessel, and the brain is digested with another ten ounces of boiling water, allowed to stand the same length of time, and

again poured off; this is repeated four times. The solutions are all mixed together, filtered, and evaporated to dryness. The dry residue is powdered and treated four times exactly as the brain was in the first instance, with a smaller quantity of water, however. The evaporated residue is dried in an oven, and then boiled in successive portions of ether. This ethereal extract is evaporated to dryness, treated with a little tepid water, filtered, and again evaporated to dryness. The residue is to be put on a glass slide with a drop of nitric acid, covered with thin glass, allowed to stand awhile, and then examined under the microscope. Crystals of nitrate of urea will show themselves if urea is present (*from Dr. Todd's Clinical Lectures, quoted in Aitken's 'Practice of Medicine'*).

THE BRAIN.

Notice all that can be seen as to the state of this organ while it is *in situ*; then remove it thus:— Having removed the dura mater, draw back the anterior lobes, divide the *tentorium cerebelli* from within outwards along the petrous bones, and cut the spinal cord as far down the canal as possible; then divide the various nerves and remove the brain, letting it fall into the left hand. Examine the base of the skull carefully; there may be fractures, caries, tumours, &c. Now weigh the whole brain *en masse*; afterwards divisions of it may be taken and weighed separately. *The normal brain weight* is—males, 46 to 53 oz.; females, 41 to 47 oz.

Now thoroughly and carefully examine the whole surface of the brain; notice the state of the vessels

(the basilar and meningeal arteries, &c., for atheroma, emboli, &c.), adhesion of the lobes ; look for tubercle or other deposit in the fissure of Sylvius. Notice the shape, symmetry, and depth of sulci, the flattening or prominence of the convolutions, &c. ; estimate the consistence, fluctuation, softening, firmness, &c., of the brain substance. Sometimes small patches of effused blood will be seen at various parts of the brain ; state exactly their situation, the same with tumours. It is of extreme importance in connection with the localisation of brain function to notice accurately the exact seat of pathologic states of the brain.

The under surface of the base of the brain contains, in order from before backwards—1, lamina cinerea ; 2, olfactory nerves ; 3, anterior perforated space ; 4, optic commissure ; 5, tuber cinereum ; 6, infundibulum and pituitary body ; 7, corpora albicantia ; 8, posterior perforated space ; 9, crura cerebri, with the third nerves (*motor oculi*) on their inner sides, and the fourth nerves (trochlear) on the outer sides. Then comes the *pons*, with the fifth (trifacial) embedded in it ; and behind this is the *medulla*, with the following nerves :—in front is the sixth (*abducens oculi*) ; at the side is the seventh, a double nerve (*portio dura*, or motor of the face and *portio mollis*, or auditory) ; farther back are the three separate nerves forming the eighth — the glossopharyngeal, the pneumogastric, and the spinal accessory ; and between the pyramidal and olivary bodies is the ninth or hypoglossal nerve.

Remove the arachnoid and pia mater, noting any

adhesions and their exact situation, as this shows localised inflammation ; they may be so adherent as to drag out the brain substance on being stripped off, or they may be separated from the brain by effusion. Some of the vessels, carefully pulled out with the pia mater, may easily be examined microscopically, and often furnish important testimony as to disease of the brain.

There are several methods of examining the brain substance ; the most general is to slice the brain in successive layers from the vertex to the base, cutting from within outwards, and leaving the slices partially attached on the outside, so as to preserve the normal relations. But a better plan is to separate the two hemispheres, and cut from within outwards and slightly downwards just above the upper surface of the corpus callosum. This will expose the roof of the lateral ventricles. Before opening the ventricles examine the state of the grey and white substance, the number of the puncta sanguinea both absolutely and relatively ; if very numerous and dark this may suggest the mode of death (asphyxia, &c.), the white part then often appears pink.

The White Substance may be denser than usual, in patches or diffused (*sclerosis*), or it may be softened, sometimes pulpy. Softening (*ramollissement*) is either *red*, or *yellow*, or *white* : the first is due to inflammation, embolism, or injury ; the second to fatty degeneration, and is frequently an evidence of syphilis ; white softening is most probably a post-mortem change.

The brain substance is often more watery than usual (*oedema*), and serum runs from it on section ;

this is probably a sign of brain atrophy, the serum being compensatory.

The Grey Matter may be paler or darker than normal — sometimes almost black (melanæmia)—firmer or softer, or the layers of varying consistence; the layers may be more distinct than usual; and the whole grey matter may be wider or narrower.

A good method of examining the grey matter is to cut as thin a slice as possible, place it between two pieces of glass, and hold it up to the light.

Cerebral Hæmorrhages, forming cystlike cavities in the brain substance, are frequently met with in various situations, and arise either from injury or disease of the vessels; in the former case they are generally found directly opposite the seat of injury; in the latter case they are chiefly in the basal ganglia. Their size varies from that of a pin's head to a large orange. In cases of cerebral hæmorrhage the blood-vessels should be examined microscopically, as it is often due to disease of the walls of the vessels. The effused blood may after a time be changed into a brown clot, or even into a decolorised fibrinous mass. Apoplexy is often associated with disease of the kidneys.

Cerebritis is rarely met with as an *acute* affection; the brain substance is redder and softer; sometimes the white substance is indistinguishable from the grey.

Chronic inflammation is generally attended with disease of the vessels, and is more local; it often gives rise to sclerosis.

Pus may form from inflammation, and is met with either diffused through the substance, or as an encysted abscess, or as ragged ulcers on the surface. These ulcers are frequently multiple, of pyæmic origin, and generally affect the grey matter. In old-standing abscesses the pus is green. It generally is very offensive and has an *acid* reaction.

In order to open the *Lateral Ventricles* a small incision is to be made in the roof, and the handle of a scalpel passed into the ventricle as a guide for the knife for the further division of the roof; the *fornix* is divided by passing the knife through the foramen of Monro and cutting upwards and forwards; the brain substance, including the roofs of the ventricles and the fornix, are now turned back, when the whole of the interior will be exposed.

Notice the state and relations of the various parts: the chief of these are—1, the fifth ventricle; 2, velum interpositum; 3, the choroid plexus; 4, the corpus striatum; 5, the optic thalamus; 6, the corpus fimbriatum; 7, the hippocampus major and minor; 8, the pineal gland; 9, the corpora quadrigemina; 10, the valve of Vieussens and the fourth ventricle.

Divide the corpus striatum and the optic thalamus so as to expose their internal structure. The remainder of the brain may be divided as is thought suitable; perhaps the better way is to cut it as much as possible in the direction of the fibres, that is, perpendicular to the surface.

The *Ventricles* in acute hydrocephalus and tubercular meningitis are distended with fluid, which

is often turbid, and the walls of the ventricles are sometimes softened. The effusion may cause atrophy of the hemispheres. Frequently the epithelium lining the cavities is granular, like sand; this is considered a sign of chronic inflammation. Sometimes there are granulations which may be as large as hemp seeds. The ventricles are occasionally found full of blood; in this case the ruptured vessel should be sought for.

Various tumours are also met with, as warty growths, carcinomata, earthy concretions, hydatids, lipomata, enchondromata, &c.

The *Choroid Plexus* is of a venous nature, and probably assists in regulating the central circulation; it is often the seat of various lesions. It may be varicose, tumefied by serous effusion; the seat of hydatids, erectile (angioma), osseous, encephaloid, and other tumours; sometimes peculiar hard yellowish bodies are found in it of a concentric structure, varying from a microscopic size to that of a small pea or nut. They have been called *corpora amylacea* by Virchow, and *concentric corpuscles* by Dr. H. Jones. Some give a brown, sometimes bluish, tint with iodine; others, however, do not show this reaction. Cysts, cystoid formations, and fatty tumours are also occasionally met with.

The *Fornix* is very frequently softened: this may be from post-mortem change or disease; the latter must not be too hastily assumed.

The most common form of tumours met with in the brain are the gliomata, which are composed of a

soft, finely granular material; they are generally multiple and extremely vascular.

Psammoma is a tumour composed of lime salts, and is of a sandy nature; *Cholesteatoma* is of a pearly lustre, consisting of closely set, glistening scales of cholestearin. *Hydatid* cysts often attain a large size, and consist of a bag containing layers of a gelatinous membrane, on which appear a number of small white dots, presenting under the microscope the heads and hooklets of the *echinococcus*.

In studying the morbid anatomy of the brain it is useful and important to have a chart of the convolutions at hand for reference; in the mortuary there should be a cast of the brain, with the convolutions marked and named.

The pathology as well as the physiology of the brain is still in a very unsatisfactory state, and one can only use general terms in describing the lesions that are met with. It is of course unnecessary to say that affections of one side of the brain show themselves on the other side of the body.

Injuries of the brain are always serious, but it must be remembered that even very severe injuries are not necessarily fatal. A case has been noticed where some brain matter escaped from the external meatus after fracture at the base of the skull, and recovery took place. For some years an editor of a paper in one of the Channel islands performed his duties with a bullet in his brain, and at his death one hemisphere was found to be completely destroyed. Injuries to the basal ganglia are more serious than affections of the vertex.

The Brain in Insanity.—Every possible lesion has been observed in insanity, but none as yet has been found to distinguish it as a peculiar affection; all those lesions that have been described as having been met with are also seen in health, or apparent health; but then, as Dr. Moxon observes, most people are suspected by their intimate friends of having some mental flaw. It is possible that, as the study of insanity becomes more exact and the localisation of brain function more definite, special lesions may be discovered. But it is probable, however, that we may have to look to other organs, especially those influencing the state of the blood, for the causes of insanity; and it is not at all unlikely that as the sympathetic nerve exercises a great influence on mental processes, so some affection of this will be found to be a potent factor in insanity.

To preserve the brain for microscopic section, put it in spirit coloured brown with tinct. iod. for four to six days, adding iod. occasionally; then keep in Müller's fluid till hard.

SPINAL CORD.

In order to remove this for examination, which should especially be done in cases of locomotor ataxy, progressive muscular paralysis or atrophy, sclerosis, &c., the whole extent of the spinal canal has to be opened; this is a difficult and tedious process.

The subject has to be laid on its face, an incision made in the median line, and the skin and subcu-

taneous tissue reflected. The muscles, fat, and tissue in the vertebral grooves have to be dissected out, so as to expose the spinal laminæ; these have then to be broken with a chisel, or sawn through either with an ordinary or with a special saw (*rachiotome*), and the spinous processes of the vertebræ removed. The cord will now be seen lying in the vertebral canal, covered by the dura mater, &c., which is not to be opened, but removed with the cord by division of the various spinal nerves. In examining it to state its consistence, &c., remove the membranes first, as a soft, swollen cord may seem hard in its resisting membranous covering.

Lesions of the Spine.—*Curvature.*—Either *angular* (*kyphosis*), from disease of the bodies of the vertebræ; lateral (*skoliosis*), the cause of which is obscure; or forwards (*lordosis*).

Fracture of the Spine.—When above the *third cervical*, death is instantaneous; in sudden death of children always look for dislocation or fracture of the odontoid process, and in other cases of sudden death from severe injuries a fracture in this part may pass unnoticed unless carefully sought for. When fracture is *high in the back*, but below the third cervical, there is palsy of the arms, difficulty of breathing, and paralysis of the bladder and lower limbs; the patient may live for two or three days, when death arises from some affection of the respiration. When the injury is in the *dorsal region*, there is paralysis of the bladder and lower extremities; death is then generally due to pyæmia or uræmia from retention of urine, and may not take place for some weeks.

Cancer affecting the bodies of the vertebræ has the remarkable effect of considerably shortening the stature of the individual.

Lesions of the Dura Mater.—The spinal dura mater is only an investing membrane, and not a periosteum, as is the cerebral dura mater, and therefore not so liable to disease. It may be thickened, inflamed (acutely rare); seat of spina bifida or abscess (from injury, psoas abscess, bed sores, scrofulous disease of vertebræ, &c.); may contain morbid growths, as cancer, fatty tumour, &c.

Arachnoid and Pia Mater.—Inflammation (*spinal meningitis*), a cause of convulsions in children, with effusion of lymph or pus (this effusion gives an appearance of irregularity to the cord); thickening and opacity (chronic inflammation); hæmorrhage (spinal apoplexy); tumours, bony plates (these are very common and have no particular importance; they might, however, be a cause of tetanus or convulsions, tubercle, &c.; tubercular inflammation renders the membranes of the cord opaque from deposit).

The Cord.—Atrophy, hypertrophy; hyperæmia (but this may be post-mortem hypostasia, from position of the body); inflammation (*myelitis*—rare) produces red, yellow, or white softening; sclerosis (general or local), from chronic inflammation. Tumours (cancer, tubercle, &c.); cysticerci, hydatids (rare).

Hydrophobia and Chorea.—No definite morbid appearance.

Tetanus.—Generally the appearances are only microscopic, and then unsatisfactory; there may be

hyperæmia, enlargement of the central canal, proliferation of epithelial elements and leucocytes, &c.

Sclerosis.—Cord looks like white of egg, of a grey colour; this is due to loss of the white sheath of the nerves. Two forms, one as disseminated granular masses, the other extending ribbon-like through the tissue.

Locomotor Ataxy.—Induration and disintegration of the posterior columns of the cord, &c.

Signs of Concussion (*as after railway accident*).—Hæmorrhage in the dura mater, injury to the ligaments and cord itself; inflammation, suppuration; after a time, softening or sclerosis.

NERVES.

Atrophied (after injury, &c., or lesion of nerve-centre); hypertrophied; inflamed (effusion into sheath, &c.); neuroma—two kinds, one true nerve increase, the other a tumour (fibroma, myxoma, &c.) pressing on the nerve; cancer (rare).

Gliomata are tumours which often spring from the retina, especially in children.

Skin diseases are sometimes associated with some affection of the sympathetic or cutaneous nerves.

XI.

ORGANS OF SPECIAL SENSE.

THE most important changes in these are noticed in surgical works; therefore only a few need be given here.

EYE.

To remove the eyeball and expose the orbit and contents, carefully break away the orbital plate.

Eyelids.—Hordeolum (stye), ophthalmia tarsi, syphilitic ulcers; trichiasis—eyelashes growing inwards; entropion—eyelids turning inwards; ectropion—eyelids turning outwards; ankyloblepharon—union of the lids; symblepharon—union of one of the lids to the globe. *Tumours.*—Nævi, hydatid cysts, tarsal tumour (enlarged Meibomian glands).

Conjunctiva.—Inflammation—catarrhal, chronic, purulent, gonorrhœal, scrofulous (with *phlyctenulæ*, or small opaque pimples, at the margin of the cornea), granular (membrane roughened), pterygium (thick, red, elevated, triangular fleshy formation). *Tumours.*—Warts, enchondromata, fibromata, polypi, &c.

Cornea. — Inflammation (keratitis)—syphilitic (like ground glass), strumous (with nodular elevations). *Ulcers.*—Leucoma, opaque cicatrix; onyx, suppuration between the layers of the cornea; staphyloma, protrusion of iris, &c.

Sclerotic.—Inflammation—rheumatic, syphilitic, &c. *Tumours.*

Chambers.—Lining membranes inflamed ; may contain blood, pus, hydatids, &c.

Iris. — Inflammation (iritis)—syphilitic, with nodules of a reddish or dirty brown colour along the margin ; traumatic, from penetrating wounds ; rheumatic, dull and discoloured without nodules ; scrofulous. Cysts, melanomata, &c.

Lens.—Inflammation (very rare), opacity (cataract) with induration, softening, or a gelatinous or fluid state.

Glaucoma (*Inflammation of Choroid*).—Eyeball hard, cornea dull, iris slate-coloured. Fluid contents of the orbit increased and turbid.

Retina. — Inflammation—increased vascularity, exudation, dulness, sometimes extravasation of blood ; suppuration ; displacement by injuries, sub-retinal effusion, &c.; *tumours*—scrofulous and others ; glioma.

Amaurosis may be due to an anæmic state of the retina, embolism of the central artery of the retina, detachment of the retina (from injury), inflammation of the optic nerve (shown by swelling and vascularity), tumours in the brain, syphilitic deposits, hæmorrhage, abscess, atrophy, softening, &c.

Cancer.—Scirrhus rare ; most frequent is colloid or melanotic.

Glioma is not really cancer ; it is formed of round-celled sarcoma.

EAR.

Auricle.—Hypertrophy, inflammation, tumours, &c., gouty deposit (urate of soda) ; hæmatoma—effusion of blood (no doubt from injury), this may be

absorbed, and then leaves the cartilages in a wrinkled state. There is a peculiar fungous disease liable to affect the subcutaneous cellular tissue, from inoculation, and produce extensive disorganisation.

Meatus.—Foreign bodies, inflammation (lining membrane swollen and vascular); abscesses (follicular), sometimes they produce necrosis of the bone; myxomata (polypi); eczema.

In all cases of deafness the internal ear should be examined by breaking away the roof with a chisel. There may be ankylosis of the stapes, disorganisation from inflammation, caries, or various deposits; obstruction of the Eustachian tube from thickening of the mucous membrane, &c.

NOSE.

The interior of the nostrils may be easily exposed, without disfigurement, by rising the upper lip, separating the mucous membrane from the superior maxilla and dividing the fleshy part of the columna.

Lesions.—Hypertrophy, inflammation, ulceration (syphilitic, &c.), lipomata, polypi and other tumours; worms or larvæ sometimes get up the nose. In sudden unaccountable death look for foreign bodies, as piece of tobacco pipe, &c., poked up the nose into the brain, through the ethmoid bone.

SKIN.

Hypertrophy.—Horny growths, corns, ichthyosis (thick and rough like fish skin), elephantiasis (as of

the scrotum, &c.) *Atrophy* in old age, syphilis, and various cachexiæ (thin, dry appearance; surface chaffy or brawny, or greasy and lustrous).

Change of Colour.—Addison's disease (*melasma supra-renale*), skin of a deep brown or greenish brown hue. This disease is thought to be dependent on some affection of the sympathetic nerve.

Skin Diseases.—Psoriasis (the red, scaly patches become pale after death); lichen; pityriasis rubra, general redness with slight appearance of excess of epidermic scales; pityriasis versicolor (*chloasma*), buff-coloured patches. Purpura; petechiæ (small effusions of blood). Eczema, herpes, lupus, &c.

Scleriosis (Fagge), formerly called *Keloid*, a swollen or brawny appearance of the skin, something like a cicatrix, for which it may be mistaken.

Syphilitic Tubercles.—Solid swellings of the skin; in size from a lentil to a hazel nut, and covered with epidermis.

Condylomata.—Generally near the genital organs; they are warts.

Xanthelasma (*Vitiligoidea*).—Two forms—1, *X. Plana*, as an opaque, yellowish-white patch, not elevated, most on the palms of hands, scrotum, ears, eyelids, &c.; 2, *X. Tuberosa*, tubercle-like knots on the elbows, knuckles, &c. Associated with jaundice.

Cancer.—Epithelioma, in form of warts; epidermis thickened, opaque, yellow, cheesy, and brittle; it may be ulcerated, and then takes the form of a deep irregular excavation surrounded by fungous warty growths.

Desquamation of the skin takes place in more or less large patches in scarlatina, gangrene, from blisters, erysipelas, &c. Post-mortem separation from decomposition must not be mistaken for these pathologic effects; there will in this case be other signs of decomposition.

THE BONES.

The chief affections in which it is necessary to examine the bones are—injuries causing inflammation, necrosis, nodes, fracture, &c.; syphilis, scrofula, osteomalacia (*mollities ossium*); rachitis (rickets); caries (of the bodies of the vertebræ produce spinal curvature).

The most convenient bone to take for examination is the femur, the thigh being opened in the course of the vessels, that is, from the centre of Poupart's ligament to the middle third of the thigh. To find the centre of ossification, open the knee joint, expose the end of the femur, and gradually pare down the cartilage, till a coloured point is noticed; the size of this must be carefully measured.

Periosteum.—May be red, swollen with effusion (acute periostitis); less red, more swollen, denser, and generally adherent (chronic periostitis); pus under the periosteum; circumscribed thickenings (nodes are signs of syphilis); a dense, hard, heavy tumour, like tendon, osteoid chondroma (or cancer), very malignant.

Bone.—Bare, white or yellow ochre colour (result of periostitis); necrosed, sequestrum enclosed in a

shell of new bone, with or without cloacæ; caries; indurated; more porous (rarefactive inflammation).

Inflammation within the medullary canal (osteomyelitis), deep redness, small suppurating patches or abscesses (frequent cause of pyæmia). Thin scale of bone detached, surrounded by sinuous grooves formed of eroded bone (as on the skull in syphilis).

Hypertrophy.—Either from deposit on the surface or condensation of tissue.

Atrophy from inflammation, injury to nutrient artery, want of use, &c.—Absorption and expansion of tissue, sometimes producing a porous state (osteoporosis); or there may be softening of the tissue by absorption of the mineral matter and substitution of fatty or gelatinous matter (osteomalacia).

Fracture.—Callus is formed where bones do not meet evenly. This will give the probable age of the fracture. At first lymph is effused, which hardens; then bony spicules appear, and so a spongy mass is formed; the ossification commences about the third week; the 'modelling' takes three or four months to complete. In deciding as to fracture of the neck of the femur regard must be had to the natural changes incident to old age.

Tumours.—Exostoses, *osteomata* (growing from the bone), osteophytes (more superficial, not continuous with the bone, from which they differ in texture); enchondromata are lobulated cartilaginous tumours, non-malignant; fibromata (rare, chiefly in the jaw);

sarcomata, of a soft, fleshy, or tough consistence, may ossify and produce osteo-sarcomata. Endosteal sarcomata and myeloid tumours grow within the medullary canal, they are generally of a deep crimson colour, dry and soft; myxomata (tumours like jelly); angiomas (nature uncertain). Hæmatoma (from effusion of blood); cephalhæmatoma is a tumour met with on the heads of new-born children from pressure during labour. Cancer (rare), generally secondary as a soft tumour within the medullary canal; tubercle (doubtful); hydatid (rare).

JOINTS.

Inflammation.—Simple Arthritis.—Redness (injected), effusion, often containing flakes of lymph, pus (in severe cases); pulpy degeneration, the effusion having formed a soft thick tissue.

Rheumatism.—*Acute* (morbid appearances have not been observed much).—Sometimes at first little change, at other times there is a pink colour; or there may be effusion, with flakes of lymph. *Chronic.*—Swollen condition of the membrane, otherwise not much change.

Scrofulous Inflammation (*White Swelling*).—In its early stage it has been seldom seen, but then as acute inflammation. *Later Stage.*—Synovial membrane is of a deep red colour, eroded in parts; this increases till all of it is destroyed; the pus is most offensive.

Pyæmic, gonorrhœal, puerperal, and scarlatinal ‘rheumatism’ are all inflammations due to septicæmia.

For the first few days the joint contains thin, dirty-coloured pus ; then destruction of the synovial membrane takes place.

Chronic Arthritis (Rheumatic).—Follows injury or rheumatic fever. In its early stage as a simple inflammation ; after a time nodular masses form round the edge of the joint ; then the cartilage is destroyed ; the surfaces of the bone are polished and gradually worn down. This disease is frequently mistaken for old-standing fracture or dislocation.

Gouty Arthritis is shown by a white, chalk-like deposit of urate of soda in and around the joint. Phosphate of soda may also deposit in the same way.

Loose Bodies often form in the joints, from a millet seed to a small almond in size ; they are composed of fibrous tissue ; their pathologic import is undetermined.

XII.

POST-MORTEM WOUNDS.

It is hardly necessary to say that the utmost care must be taken during a necroscopy not to prick or scratch the skin, especially so if the subject has died of peritonitis, puerperal fever, erysipelas, scarlet fever, and other zymotic diseases, also when the body is in a state of decomposition.

If the skin is injured before commencing the examination, apply Friar's balsam, tincture of tolu, or collodion; then cover with several layers of sticking plaster, and grease or wax this well, so as to make it water-proof.

If the skin is injured whilst performing the necroscopy, wash in *cold* water, suck well, and afterwards bathe or soak it in a mixture of dilute sulphurous and carbolic acid, as strong as can be borne. It must be remembered, however, that strong carbolic acid will produce a painful sore, and that both these acids in a dilute form, applied for some time, will destroy the epiderm; but this last effect is not of much consequence.

The painful inflammations which often arise from post-mortem wounds are relieved by painting the part with strong perchloride of iron solution. If constitutional symptoms show themselves, as inflammation of the lymphatics, these are best met with hyposulphites, of which the magnesian are the most efficacious; they should be taken very frequently, as every two hours. The sulphurous acid applied locally and the hyposulphites taken internally are so powerful in counteracting septicæmia that by their use blood-poisoning may be almost entirely prevented.

XIII.

INSTRUMENTS REQUIRED.

THE fewer instruments the better when the necroscopist has to carry them all with him, but in a well-appointed mortuary everything that can assist, even in minute details, should be provided. The ordinary post-mortem cases as supplied by the makers are generally sadly deficient and inefficient, and therefore it may be well to draw attention to some of the most useful instruments.

1. **Scalpels.**—Three or more of moderate size, with rather broad blades, the cutting edge curved more than those usually used, and the points blunted. Two or more of the usual kind for special purposes, and a large one for cutting the cartilage of the ribs. A long, thin, moderately wide-bladed knife, for slicing the brain, kidneys, &c. A Valentine's knife is very useful for making microscopical sections.

2. **Saw.**—This may be an ordinary meat or dovetail saw, with or without a movable back; a special saw or *rachitome*, for opening the spine, is often required.

3. **Scissors.**—Straight and curved, also a pair for cutting the intestines, one blade hook-shaped (enterotome); it is useful also to have a bronchotome, or narrow, unequal-bladed scissors, for opening the bronchi and blood-vessels.

4. **Forceps.**—These should be longer and stronger than the ordinary dissecting forceps.

5. **Hooks.**—Best mounted in handles; those on chains are dangerous; hooks may be extemporised

out of bent wire or pins with string attached. In fact, pliable copper wire will be found very serviceable for various purposes.

6. **Wooden Mallet and Common Chisel.**—A layer of leather or rubber on the striking part of the mallet serves to deaden the sound of the blows.

7. **Tape Measure.**—Made of American cloth.

8. **Spring Balance**—or beam scales—to weigh from a quarter of a pound up to ten pounds. In the mortuary a larger one should be provided for taking the weight of the entire body.

9. **Needles.**—These must be strong, with a double curve and cutting points, about five inches long. A few smaller ones with single curves are sometimes needed.

10. **Cord.**—Nothing answers better than the coarsest crochet cotton, or very even string, which should be well waxed before using.

11. **Pins** with and without guarded points. These last are serviceable for fastening up holes in the intestines, stomach, &c.

12. **Bone Forceps.**—Large and powerful, hawk's beak shaped are best; if made with removable handles, the better for portability.

13. **An Iron Ring**, with three screws to fasten to the head to guide the saw, and with a handle to steady the head.

14. **Several Blocks of Wood** to support the head; in the mortuary, however, a head-rest should be attached to the table with adjustable screw slide. A modification of the iron ring and head-rest combined is very good.

15. **Various Minor Necessaries.**—Sponges, calico rollers, cloths, pieces of oiled silk or gutta-percha tissue (for taking away specimens), blow-pipe, india-rubber gloves, Coddington or Stanhope lens, hone, pots and jars for specimens, &c. In a well-appointed mortuary provision should be made for photography.

16. **Disinfecting Solutions.**—*Permanganate of Potash*, or *Condy's Fluid*; *Sir W. Burnett's*, or *Chloride of Zinc*.—This latter solution is colourless, inodorous, and, diluted, preserves tissues almost for ever. *Sulphurous Acid* is the most valuable, removing the cadaveric odour and preventing post-mortem sores; this, combined with about a fourth part of carbolic acid to ten parts of water, is perhaps more efficacious. *Bond's Terebene* sprinkled over the body removes much of the unpleasant smell. *Carbolate of Soda* and dilute *Carbolic Acid* are very useful.

APPENDIX.

ORDER OF EXAMINATION AND TABLE FOR NECROSCOPIC RECORD.

* * *The figures in brackets refer to pages in the body of this book.*

PRELIMINARY OBSERVATIONS.

Place where necroscopy was conducted—date—name of deceased—age—place where seen—persons present—remarks on their behaviour, &c.—state of locality—objects near. Measurements of distances to be accurately made.

EXTERNAL EXAMINATION.

Appearance of Body (7).—Condition—position—clothing—height—weight—muscularity—proofs of death (10). Objects likely to have caused death, as knives, cords, bottles, etc., notice how and where they are placed. Preserve any vomited matters, also blood-stains.

State of the Skin.—Clean or dirty, natural or acquired colour (7, 9, 123). Signs of decomposition (7, 10). Marks of injury, disease, tattooing, nævi, warts, scars, &c. (8). Condition of mammæ; silvery lines of pregnancy on abdomen and breast (9, 100).

State of the Natural Orifices.—Eyes, ears, nostrils, mouth (44), anus (61), urethra (85). Look for foreign bodies, signs of wounds, &c., in these.

State of the Limbs.—Position; *rigor mortis*. Size of hands and feet; delicately or coarsely formed, showing signs of handicraft (7). Special marks. Condition of the nails; contents (blood, dirt, grass, &c.) (7).

Features.—Relaxed or contracted; eyelids closed or open; condition of cornea and pupils (10). Mouth (44); contents, position of tongue, state of the teeth.

Carefully examine *the Spine* for dislocations, fractures, punctures, &c. (118).

INTERNAL EXAMINATION.

Thorax uncovered (not opened), abdomen opened (13). Amount of fat or its absence on chest and abdomen. Wounds. State and position of the undisturbed abdominal contents (50), peritoneum, mesentery, &c. Foreign bodies; disease (51). Position of the diaphragm.

Thorax Opened (13, 32).—Position of thoracic organs. Pericardium (16); mediastinum; pleura (*undisturbed*).

Heart (18).—Shape, appearance, weight. State of coronary vessels. Bulging of auricles and ventricles; fat.

Cavities.—Clots; muscular structure; valves.

Vessels.—Aorta, pulmonary artery, vena cava, &c. (26).

Larynx, Trachea, Bronchi, &c. (33).—Abnormalities, foreign bodies, disease, &c.

Lungs (35, 36).—Pleura—adhesions, contents. Right and left lungs—colour, consistence, appearance, weight, &c.

ABDOMEN.

Liver.—Form, weight, consistence (62). Gall bladder (68).

Pancreas. Spleen (69).

Kidneys (73).—Right and left; appearance of cortical

and medullary substance; weight. Suprarenal capsules (72).

Semi-lunar Ganglion, etc. (73, 120).

Stomach (46).—Size, appearance, contents (49, 143). Tie up both the ends before removing; and, if necessary, seal the whole up at once in a jar (142).

Peritoneum, mesentery (50).

Intestines (53).—Duodenum, ileum, ileo-cæcal valve, appendix cæci, cæcum, colon, sigmoid flexure, rectum. Appearance, position, contents, disease, &c.

Bladder (79).—Full, empty, state of mucous membrane. Prostate; urethra; penis (84), testicles (83), &c. Uterus (91), vagina, &c. (97), poisons may be introduced per vaginam; ovaries (88), state of the Graafian vesicles, &c., Fallopian tubes, &c. (91).

HEAD.

Scalp, bones, fontanelles.

Brain.—Dura mater and arachnoid; pia mater—superior surface, base, fissures (102). Grey matter, white; ventricles—1st and 2nd, 3rd, 4th and 5th. Corpus striatum, optic thalamus. Velum interpositum, choroid plexus, &c. (110).

Base of skull, fractures, caries, tumours, &c.

Spinal Cord (117).—Marks of injury, disease, &c., in the vertebræ and in the cord itself. Dislocation of the atlas.

Organs of Special Sense (121).—**Ear**.—*External meatus*, disease, injury, foreign bodies. Inner ear. Eustachian tubes (122).

Nose.—Disease, foreign bodies, punctures through the ethmoid bone (123).

Eyes.—Eyelids, orbit, cornea, lens, chambers, retina, optic nerves (121).

Bones (125).—Fractures, dislocations, shape, colour, length, disease, &c. Centres of ossification in clavicle, maxillary bones, sacrum, pubes, os calcis, sternum, clavicle, femur (139). Examine the shape, size, &c. of the pelvis.

In describing the morbid and other appearances of an organ notice:—Its position and relation to the surrounding parts, adhesions, fluids, and other matters in contact. Its shape, size, weight, and odour. State of the surface—colour, thickening, thinning, or adhesion of its natural covering; effusion beneath it, &c. Then notice the consistence, colour, odour, appearance, &c. of the parenchyma on section; contents of the organ. If pale, wash with water and test with iodine. Scrape the surface of the section with a knife and examine the scraping microscopically for cancer, micrococci, bacteria, hydatids, &c. Inflate the lungs; use the hydrostatic test.

TO SEW UP THE BODY.

Fasten two curved needles to each end of a waxed piece of cord four times the length of the part to be sewn. Begin at the symphysis pubis, pass each needle through the skin from within out as near the edge of the incision as possible; let the middle of the cord make the first stitch, then sew at regular intervals, passing the needle through the skin from within; when several stitches have been made, draw the edges of the incision together tightly, as in lacing, and fasten off by tying the ends.

Place the skull cap in position, and keep it so by two stitches passed through the ends of the temporal muscles and tied tightly together; cover with the scalp and then sew this up.

TO PRESERVE TISSUES FOR MAKING MICROSCOPICAL SECTIONS.

The parts of the organs to be examined are cut up into pieces about the size of a chestnut, and placed at once in Müller's fluid, which will be found most convenient for general use. This solution is made by dissolving 20 to 30 parts of potassium bichromate and 10 parts of sodium sulphate in 1000 parts of water. The solution is to be renewed in eighteen hours, and every week subsequently for

a month or six weeks or more ; the preparation is then often hard enough to cut sections from, but if not, it is to be put in spirit till hard, or in chromic acid 1 part, water 20, and rectified spirit (methylated) 180.

The best way to preserve and harden several specimens is to suspend them in a large quantity of the fluid. A very good plan is to have a leech vase or a bell jar to contain the solution, and the pieces of tissue, weighted if necessary, fastened to silver wires, or silk cords or even fishing gut, of varying lengths, attached to pieces of cork, which will float them. The corks are to be numbered, and the numbers are to correspond with a register of the pathological specimens. The corks may be kept separate (if necessary) by small strips of wood stuck in them. By this means several hundred portions of tissue can be kept to harden in a comparatively small space. The fluid must be renewed occasionally, and fresh portions of a stronger solution added frequently.

If Müller's fluid is not at hand, a solution of common salt in water is useful to preserve the tissue for some time almost unchanged.

MEDICO-LEGAL NECROSCOPIES.

More than ordinary caution has to be observed in conducting medico-legal examinations, and they should, where it is practicable, always be entrusted to a skilled necroscopist; the medical attendant, who was present at the death or during the illness, attending to furnish information, and also to assist in taking notes.

None but those engaged in the necroscopy and those appointed to witness it, are to be allowed to be present, especially if likely to give evidence; and no opinion should be pronounced till the necroscopy is completed.

No medical man is on any account to perform a necroscopy without the special consent of the proper authorities, and this ought to be in writing.

If the body has to be exhumed, some of the soil immediately above and below the coffin is to be reserved for analysis; for this purpose it must be carefully sealed up at once.

Infanticide.

Viability.—A child *may* live if born at the sixth month. The signs of having reached this age are—‘*Length*, from 8 to 13½ inches. *Weight*, 1 lb. to 2 lbs. 2 oz. *Skin* has some appearance of fibrous structure. *Funis* inserted a little above the pubes. Liver of a dark red colour. Points of *ossification* in the four divisions of the sternum.’ (From Guy’s ‘Forensic Medicine.’)

From this age the child increases in weight and length; the skin becomes more fibrous, and is covered with an unctuous matter, and fat appears in the subcutaneous tissue.

Notice the measure from the vertex to the umbilicus, and from thence to the soles of the feet; weight; state of the face (eyes, with or without *membrana pupillaris*), limbs (nails),

generative organs, position of testicles, points of ossification in the *clavicle*, *maxillary bone*, *sacrum*, *pubes*, *os calcis*, *sternum*, *astragalus*, *femur* (*lower end*), &c. The point of ossification is easily obtained by exposing the end of the bone, and slicing the cartilage gradually till the ossific point is reached, which is of a deeper colour than the cartilage. Shape of the *liver*, and comparative size of lobes; contents of gall bladder.

Intra-uterine Maceration is distinctive. Body is shrunk, bones softened; the skin appears as if boiled or poulticed, is slimy, and readily comes off in patches; face and generative organs of a deep red colour; the subcutaneous tissue looks like gooseberry jelly. The umbilical cord is straight and flaccid.

Respiration Test.—The proof of respiration is a proof of life. But—1, respiration may take place before delivery; 2, it may be so partial as to escape detection; 3, an artificially inflated lung may give the appearance of a respired lung.

An Unrespired Lung is like a piece of liver, of a uniform bluish-red colour, and sinks in water. It may float from putrefaction, but pressure will easily expel the gases so formed and cause it to sink.

A Respired Lung is nearly always pinkish—mottled if respiration is imperfect; the lighter patches are groups of air cells, which under the microscope have a very characteristic appearance.

Hydrostatic Test.—Put both lungs in a vessel of water, then each separately; then cut up into about twenty pieces, and test *each* of the pieces. Take the piece or pieces that float; put it, or them separately, in a strong cloth, and squeeze under a board; then put in the water again. If they sink, the lung is an unrespired or an uninflated lung.

Examine the Stomach for food; the *Intestines* for meconium; the *Bladder* for urine. Notice state of umbilical cord.

Other Facts Proving Life.—Obliteration of the um-

bilical arteries and vein, of the ductus arteriosus and venosus ; closure of the foramen ovale. *The patency of any of these is no proof of still-birth*, nor can any definite period of survival be formed.

The Skin in a few days exfoliates as a fine dust ; this exfoliation is a decided proof of life. *The Umbilical Cord* shrinks and withers and becomes flabby, with sometimes a circle of a distinct red colour round its insertion ; this takes place in a few hours ; in one or more days it dries up, and about the fifth day falls off ; the wound cicatrises about the eleventh day.

Violence.—Fontanelles may be punctured ; instruments passed up vagina, rectum, &c. *Suffocation.*—Notice marks of pressure. Stomach may contain matters causing the suffocation (as fæces, feathers, &c.) *Strangulation.*—The cord may be twisted round the neck during delivery ; measure the length of the cord, notice its state, see if it corresponds with the marks on the neck. Look for finger marks on the neck, and judge which hand caused them. *Fracture of the Skull* may be caused accidentally ; *Contusions*, too, both may be produced during labour.

Notice if the cord has been properly attended to ; if not, if the body is exsanguine ; if the child has been exposed ; if starved.

Starvation.

Emaciation in chronic cases is extreme, in acute cases less or even not at all. *Stomach* and *Intestines* empty, fauces dry ; heart and blood-vessels generally empty ; putrefaction is rapid and sets in early, and the body smells offensive. But disease may cause all these appearances.

Suffocation.

Necroscopic signs not satisfactory. The *Skin* is generally of a uniform violet tint, with blackish ecchymotic spots. The *Lungs* frequently show punctiform ecchymoses and partial emphysema. The other organs are deeply congested.

Hanging.

Signs after death are those of suffocation. There is also *the mark of the cord*. This varies in position, depth, and appearance, according to the mode of hanging, struggles, weight of body, and material used. There may be only a depression, or the mark may be, after exposure, of a deep brown colour. Examine the vertebræ for fracture or dislocation, as of the odontoid process. The *Tongue* is generally swollen at the base, injected, and sometimes protruded. The penis is more or less erected, sometimes with emission; in females the genital organs are swollen and red. Fæces often expelled.

Drowning.

Appearances vary very much, according to the mode of death; this may be from apncea, exhaustion, syncope, apoplexy, shock, blow on the water or a projection, cold, &c., or any of these together.

The *Tongue* is swollen at the base; the *Skin* is pale, with violet or rose-coloured patches; *Lungs*, brain, kidneys, &c., congested; left side of *Heart* empty, right side full of blood. These are signs of apncea. Special signs of drowning are—mud, sand, water-plants, &c., in the hands, nails, ears, nostrils, &c.; fingers often excoriated. Water, &c., in the *Lungs*; this may, however, enter *after* death; water in the *Stomach* is a very strong presumptive evidence.

Retraction of the penis, *cutis anserina*, froth in the mouth and nostrils, may also be noticed.

A chemical analysis of the water might at times afford valuable evidence.

POISONS.

THE necroscopic appearances in cases of poisoning are not always very decided, and great care must be taken to avoid drawing incorrect inferences. In some cases there are no post-mortem signs at all, and it is only when a strong corrosive poison has been taken that they are at all decided.

The necroscopy in these cases must be performed with extreme caution in the presence of one or more competent witnesses. All instruments, vessels, and appliances of every kind must be scrupulously clean. The jars, bottles, or other vessels to contain the portions selected for chemical or other analysis should be washed out with water, then with strong sulphuric acid, again with water, and finally with distilled water.

Both ends of the stomach are to be securely tied up with double ligatures, secured by a pin to prevent slipping, and separated by cutting between these. It is well sometimes to put it up whole in a jar for more leisurely examining it, or for a more competent person to do so; it must be remembered, however, that the gastric juice may act on the coats and destroy them, it is therefore always best to put the stomach and contents in separate vessels. If it is wished to examine it at once, put the contents in a clean jar; lay the organ on a clean flat surface, as a dish or piece of glass; open it along its smaller curvature. Look carefully for leaves and seeds of plants, powders, &c. Tie both jars over with gutta-percha tissue, first putting a cork or stopper in if there is one, then a piece of white paper over this, and seal it so that they cannot possibly be removed without breaking the seal, and use a stamp that is not likely to be imitated; fasten a label to each jar or bottle, with the name of the contents, the date, and the signature

of the necroscopist. The liver, kidneys, spleen, intestines, and brain, or portions of these, should each be put in a separate vessel, and also carefully sealed and labelled. Where, however, the jars are taken straight to the analyst by the necroscopist, there is not so much need to seal them, yet it is far better to do so in all cases.

In making the necroscopy the intrusion of foreign bodies must be carefully guarded against, especially if they are of a metallic nature, as pins, needles, nails, copper rings, bits of coloured paper, pieces of sealing wax, &c. The accidental presence of any of these with the part to be analysed might spoil the whole analysis.

Poisons may be introduced *per rectum* or *per vaginam*.

Narcotics—as *Opium*, *Belladonna*, *Hyoscyamus*, *Camphor*, &c.—give no satisfactory necroscopic appearances. Congestion of the brain has been met with, and a few other signs supposed to point to the cause of death. *Belladonna*, *hyoscyamus*, and *camphor* have each a peculiar smell, which may be more perceptible after gently warming the contents of the stomach. The seeds of *belladonna* and *hyoscyamus* may be discovered.

Alcohol, *Æther*, *Chloroform*, *Hydrate of Chloral*, &c., produce inflammation of the stomach and bowels, and the characteristic odour of each will serve to distinguish them.

Strychnia leaves no decided signs of its presence; the muscular spasm soon passes off, but the hands may remain clenched, &c.

The Metallic Poisons show few post-mortem signs. *Nitrate of Silver* is turned into chloride, which adheres to the mucous membrane in the form of curdy flakes, and the œsophagus and stomach are eroded. *Copper* causes inflammation, thickening, and sometimes ulceration of the mucous membrane, which is changed to a green colour. The skin is often yellow. *Antimony* and *Arsenic* generally produce

inflammation of the stomach and intestines, but not always. In arsenical poisoning the solid metallic oxide may be seen adhering in patches to the mucous membrane; this often turns yellow, when decomposition sets in, by the formation of the sulphide. The contents of the stomach are generally of a brown colour.

Phosphorus.—This also produces patchy inflammation, and particles of the substance may be found (as heads of matches, &c.) in contact. The skin is of a peculiar yellow tinge, and there is frequently extensive fatty degeneration of the muscles, liver, &c.

Various Salts of an irritant nature, when taken in large doses, may be poisonous, as *Potassium Nitrate*, *Sulphate*, *Acid Tartrate*, and *Sulphide*; Alum; Sodium Chloride; Chlorinated Soda, Lime, Potash, &c.; Barium Salts; also Iodine. These occasion inflammation of the stomach and intestines, with secretion of a slimy mucus, thickening of the coats, hyperæmia of the vessels; sometimes ulceration. Potassium Sulphide deposits sulphur.

Alkalies.—*Soda*, *Potash*, *Ammonia*, and their *Carbonates* generally produce softening and corrosion of the mucous membrane, with inflammation and extravasation of blood in patches; ammonia causes more extensive inflammation. *Cyanide of Potassium* is also a caustic alkali.

Acids—as *Sulphuric*, *Nitric*, *Hydrochloric*, *Oxalic*, *Carbonic*, &c.—occasion more or less corrosion in the mouth, on the lips, chin, &c., varying according to the amount and strength of the acid. There is considerable inflammation, often œdema and contraction of the parts touched by the acid. The glottis may be closed by this swelling and contraction. The contents of the stomach are generally a sticky liquid of a black, yellow, or brown colour, and it is distended with gas. The mucous membrane of the œsophagus and stomach may either be detached, shrivelled,

or converted into a white (sulphuric acid), yellow (nitric), or brown substance (oxalic, &c.) ; sometimes the walls are perforated. (See p. 49.)

Prussic Acid.—This can generally be easily distinguished by the smell. The features are often peculiarly lifelike—the eyes glistening, the cheeks coloured, &c. The blood is of a bluish tint.

Carbonic Acid.—There are signs of suffocation, bloated appearance, livid spots on body, distension of abdomen; eyes glistening and prominent. The blood is of a dark colour, and the right cavities of the heart are gorged.

GLOSSARY.

Achorion Schœnleinii, the fungus of favus or tinea favosa.
Adenomata, tumours formed of gland substance.

Amyloid Degeneration (waxy, lardaceous) is the deposition of a peculiar substance, whose nature is uncertain, in various organs. It is characterised by the waxy appearance and the action of iodine, which turns it brown, the subsequent application of dilute sulphuric acid producing a bluish or black colour.

Anchylostomum duodenale, a small round worm found in the duodenum jejunum.

Angiomata, vascular tumours, as nævi, erectile tumours, &c.

Ascaris Lumbricoides, a round worm found chiefly in the intestines.

Atelectasis, an unexpanded condition of the lung.

Athroma, a fatty degeneration of the arterial coats.

Atrophy, a change in the structure of a tissue, either by a decrease in *size* or a diminution in *number* of its histological elements. It is often difficult to tell if an organ is atrophied.

Bacteria, rodlike, microscopic bodies which form in putrefying fluids, and are believed to be the cause of septicæmia, &c.

Calcareous Degeneration, a deposition of lime salts; it is almost always secondary, especially to fatty degeneration.

Cancer, Carcinomata, four varieties—scirrhous, encephaloid, colloid, and epithelioma. It is probable that they

only differ from one another in structural changes, and are all of an epithelial character.

Caseation, a change produced in an inflammatory product, so that it becomes friable, yellow, and dry ; it is especially met with in tuberculosis.

Cirrhosis and *Sclerosis* of an organ are both due to an excessive increase of connective tissue, so that it is hardened and its natural structure absorbed or otherwise destroyed from pressure.

Cysts, capsules containing fluid, which may be either retained normal secretion, as sebaceous matter, mucus, saliva, milk, &c., or extravasated fluid, as hæmatocele, or formed independently, as from softening of the tissues, inflammation, irritation (as from a foreign body), congenital development, parasites, &c.

Degeneration, a change in the nature of a tissue either by infiltration or metamorphosis of its histological parts. Fatty infiltration and fatty degeneration are totally different terms, and must be carefully distinguished. Fatty degeneration is a form of atrophy.

Distoma hepaticum, liver fluke, a flat, lancet-shaped worm.

Enchondromata, cartilaginous tumours which form chiefly on or in bone.

Endothelium, the delicate membrane lining the interior of organs and parts of organs ; it has an important influence in inflammation, effusion, &c.

Epithelium, the membrane covering the external parts, &c., of organs.

Exostosis, bony tumours which arise from a bone and are inseparably connected with it ; they must not be mistaken for abnormal congenital processes, as a supra-condyloid or episternal bone, &c.

Fibromata, fibrous tumours, developed from connective tissue, are of a fibrous, more or less dense structure.

Filaria Medinensis, guinea worm, found in the legs and feet, like a bit of thread coiled up, from six inches to twelve feet long.

Filaria oculi humani, found in the human eye.

Filaria sanguinis, a small thread worm met with in the blood, often the cause of hæmaturia and some obscure affections.

Gangrene, or *Necrosis*, the arrest of nutrition, and consequent death, of a particular part.

Gummata, tumours characteristic of syphilis, of a yellowish white colour and firm consistence, surrounded by a pseudo-capsule formed of degenerated tissue. They are distinguished from scrofulous deposits (cascation) by not being friable.

Hæmatoma, a non-vascular tumour, consisting of fibrin derived from previous effusion of blood.

Hodgkin's Disease is characterised by enlargement of the lymphatic glands and spleen, also by lymphatic formations in the liver, kidneys, &c., without increase in the white corpuscles of the blood.

Hyperæmia, an excess of blood in the arteries of a part; may be active or passive. Post-mortem hyperæmia depends on the position of the body, and is due to the gravitation of blood to the lowest parts. Ante-mortem hyperæmia may pass off after death from draining away of the blood. If present it gives a reticulated appearance to the tissue, and must not be confounded with the uniform staining of post-mortem congestion.

Hypertrophy, an increase either in the size or number, or both size and number, of the tissue elements.

Leptothrix buccalis, a parasitic alga found in the mouth between the teeth.

Leukæmia, or *Leucocythemia*, a disease attended with enlargement of the spleen and lymphatic glands, and an increase in the white corpuscles of the blood.

Lipomata, fatty tumours.

Lymphomata, tumours consisting of increase in the lymphatic tissue; it is peculiar to Hodgkin's disease.

Malignant, a term applied to tumours which reproduce themselves both before and after removal; it must not be used as synonymous with 'cancerous.'

Microsporon furfur, the fungus of chloasma or pityriasis versicolor.

Myomata, muscular tumours formed of smooth muscular fibres; they constitute the so-called 'fibrous tumours' of the uterus.

Myxomata, tumours formed of mucous tissue; are of a glue- or jelly-like consistence, such as nasal polypi, &c.

Necrosis, the death of a particular part from arrest of nutrition.

Oidium albicans, the thrush fungus.

Osteomata, true bony tumours; they must not be confounded with calcareous degeneration, which is only a deposit of earthy matter without any organisation.

Osteophytes, inflammatory products, which are somewhat diffused over the surface of a bone, and are not very adherent to it.

Oxyuris vermicularis, a thread worm, found mostly in the rectum, but may migrate elsewhere, as into the female urethra, &c.

Psammomata, 'sand tumours;' they are of an irregular globular shape, generally pedunculated, pink or white, firm and gritty on section.

Pus is a corpuscular fluid, only certainly demonstrated by the microscope:

Pyæmia, a general disease due to the introduction into the circulation of some morbid poison (not pus), the nature of which is at present unknown.

Rigor mortis, the rigidity which appears shortly after death, characterised by stiffness of the muscles. It comes on soon and passes off soon—often within a few minutes—in those who die of a lingering death, as phthisis. It appears late and lasts long when death is sudden and the person in perfect health; sometimes it does not come on till after ten or twenty-four hours, and may last from one to three days. In cases of poisoning by carbonic acid or sulphurous acid, or death from lightning, it appears very early indeed, and passes off as rapidly.

Sarcomata, tumours of a soft, fleshy, or brain-like consistence, consisting of undeveloped connective tissue.

Sclerosis, see *Cirrhosis*.

Septicæmia (ichorrhæmia), probably a variety of pyæmia or it is due to the presence of bacteria.

Strongylus gigas, a large round worm which inhabits the kidneys.

Tænia solium, the tape worm, flat, jointed, white, with hooklets round its head.

Tænia echinococcus, a small tape worm with thirty or forty hooklets round its head ; the larval forms are known as hydatids, echinococci, acephalocysts, &c.

Tænia mediocanellata, a large hookless tape worm.

Trichina spiralis. The larval form is found in muscle, and produces the disease called *trichiniasis*. It generally appears as a small speck in the muscle, which, when magnified, shows the worm coiled up in a cyst. The mature form is found in the intestines.

Trichocephalus dispar, a threadlike worm, found chiefly in the cæcum.

Trichophyton tonsurans, the fungus of ringworm, herpes circinnatus, &c.

Tubercle, a definite pathological formation, in its early stage as a greyish translucent nodule, which subsequently undergoes various changes, chiefly caseation.

Tumours may be *heterologous*—that is, different from the part from which they arise—or *homologous*—that is, the same as the part they grow on. Tumours may undergo an alteration of texture in the course of their growth.

Vibriones must not be confounded with *bacteria*, they are very minute bodies which join together like strings of beads. They are found in all decomposing fluids.

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